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Vol. VI. NEW YORK, SEPTEMBER 5, 1885. No. 10.

IT is hard to tell whether the suit for $2,000,000 against the Western Union Company by the receiver of the Bankers & Merchants' Company is brought seriously or is intended as a game of bluff. Still, the receiver seems entitled to some compensation for the injury done by that remarkable raid which General Eckert directed in person.

WE understand that the Telegraphers' Mutual Benefit Association has been invited to hold its annual meeting at Chicago in November next. The idea is excellent, and we trust that the Executive Committee will see the way clear to an acceptance of the hospitality of the Chicago brethren. There can be no question that the delegates would have "a good time" in Chicago.

ONE way and another, New England has its attention occupied with telephonic matters. In Boston the control of private lines has been exciting controversy, several cities and towns are agitated over the raising of exchange rates, and Lowell is anxiously awaiting developments in the investigation of the old Erie management. But then New England folk always were mightily interested in the telephone.

ALL the cable-laying has not been done yet. A new cable from England to South Africa is said to be absolutely necessary; another cable to Australia is not less wanted, and another line of cable communication between England and the West Indies has long been demanded. These are not days when a nation with colonies can afford to go without cables on the score of expense, and it is safe to predict that some new cables will soon be laid, the dividend being in whole or in part guaranteed by the government.

WE were the first to publish any illustration and description of the Daft dynamo and motor. We were also the first to describe and illustrate the Daft system as applied to the street car line at Baltimore; and to-day we have the pleasure of giving to our readers the earliest details of the fine new Daft motor, "Benjamin Franklin," now running on the Ninth Avenue Elevated Railroad, and notable not only for its size, but as being the first of the many motors that will be required for passenger traffic in New York City.

THE prospects are that a very enjoyable and profitable week will be spent at Providence by the National Telephone Exchange Association, whose seventh annual meeting begins at the Narragansett Hotel, on the 8th inst. A large amount of important business will be disposed of during the sessions of Tuesday, Wednesday and Thursday, and there are indications that the locality will maintain its reputation for hospitality, the secretary announcing in his circular to the members that "the afternoon of Thursday and Friday will be devoted to social entertainments."

IT is reported once more that another strike is contemplated by the telegraph operators, on the ground that they have to work extra time without pay. But we question whether there is the slightest likelihood of a strike. That the men may refuse to work overtime without equivalent pay is, however, not improbable, and in that event they would receive the moral support of public and press. The month may witness developments in this direction. The trouble with some of the organizing operators is that they 'give themselves away" before they are ready for concerted action, and thus sacrifice their opportunity.

THE desire to reduce telephone operating expenses has led to the invention of numerous exchange systems of more or less merit, and, as future profit from telephony will lie rather in what can be saved on working than in what can be made from the sale of stock or from round subscription rates, it looks as though this might be a rich field for the ingenious electrician to employ his talents in. The subject is of great present interest, and we therefore give considerable space to-day to a new exchange system that is receiving serious attention from thoughtful telephonists wishful of hitting upon true methods of economy.

WE notice the report to be on the rounds, as though it had never been denied, that the fire which destroyed the Montezuma House at Las Vegas, New Mexico, was caused by the ignition of woodwork by overcharged electric light wires. There has not been the least evidence to confirm this story, but, on the other hand, the manager of the hotel says: "Our opinion is that the fire was the work of an incendiary and that it could not possibly have been caused by the system of incandescent lighting used throughout the house." In fact, the light was of great service in those parts of the hotel that were unvisited by fire, preventing panic and enabling the hotel staff to save property.

ONE of the amusing incidents of the recent mysterious negotiations between the Western Union and the Baltimore & Ohio Telegraph Companies for the sale of the latter's lines has been the offer by the devout and decorous Mr. Cyrus W. Field to wager $10,000 that he had told the truth in the matter, and that either Mr. Garrett or Mr. Bates had misrepresented the whole case. The bet has not been taken up by either of the Baltimore & Ohio representatives, but Mr. E. S. Stokes, now President of the United Lines Telegraph Company, has with cruel flippancy offered to bet Mr. Field $10,000 that the Western Union Company is not earning three per cent. on its stock. Mr. Field must feel that he has sacrificed his high-toned morality to little effect. His first effort to bet will probably be his last.

WE were remarkably pleased a short time ago in observing the fine effect produced on board some of our warships—for we still have a few—by the use of the electric light in both arc and incandescent forms. There is no question that the electric light is preëminently the light for steamships and especially for men-of-war. The English newspapers are now unanimous in saying that the visit of the Lords of the Admiralty to H. M. S. Colossus must have removed any doubt on their part as to the transcendent superiority of the latest system of illumination. The conservative and sober London *Times* goes so far as to say in regard to lighting for the navy and the mercantile marine, that "the superior comfort and even the necessity of electric lighting will soon be universally recognized in a practical manner." These are cheery words for electric light people.

IT cannot be said that the Electrical Subway Commissioners are eliciting much that is very new in their present series of audiences to inventors and electricians. The most important personage to appear before them this week was Dr. Norvin Green, who retold the old story as to what the Western Union company has already done in underground experimentation, and who took occasion to say a good word for the Brooks system. He stated, too, that the company intends ultimately to extend its underground wires from Twenty-third street to Forty-second, thence through the New York Central tunnel and out along the railroad to Harlem. A good point was made, too, in favor of underground railroads, in his statement that by means of the Metropolitan Underground road, the wires were easily carried all over the vast city of London. If New York had a system of underground roads, there would be no electric wire nuisance at all.

AN English newspaper describes Mr. John Pender a being surprised that "in a country as intelligent as the United States and so greatly dependent for its progress and development on railroads and telegraph lines, the press should so frequently be hostile to such enterprises." If Mr Pender actually committed himself to this remark, we can only say that it does little credit either to his sagacity or his information. We would very much like to have Mr. Pender name any paper in this country, out of the thousands printed here, that opposes railroads and telegraphs. In fact, we believe that Mr. Pender's fellow countryman, Mr. John Ruskin, is the only outspoken opponent of these two most striking triumphs of modern civilization. But there are, we gladly admit, a great many papers here that oppose the shameful methods by which telegraph and railroad lines are over-capitalized and made the means of fraud and extortion; and we trust the number of such papers will never grow less.

THOUGH the Patent Office continues to be busy in the issuance of documents ornamented with blue ribbon and a red seal, there is not wanting support of the old adage that nothing new can be found under the sun. Early in the present year, we mentioned Professor Lodge's experiments with a static machine, by the spark of which he precipitated dust from the air; and about three months ago we described at some length the analogous process for passing sparks from a static machine through the fumes from a lead smelting establishment, and thus condensing them. The fumes agglomerated at once, and settled down in flakes in a few minutes. This process was hailed not only as a valuable application of electricity, but as new. Now comes on the scene the inventor primeval, one C. F. Guitard, who in a communication to the London *Mechanics' Magazine*, October 29th, 1850, it appears, described experiments of his own very similar to those so brilliantly performed by Prof. Lodge. Guitard filled a jar with tobacco smoke, then passed through the smoke the current or spark from "a small electrifying machine" and obtained immediate condensation. His reflection was as follows: "It was astonishing to see how small a quantity of electricity produced a most powerful effect. I am not aware that attention has ever been drawn to this subject; and the question will probably arise, has electricity anything to do with the condensation of steam in the condenser?" Is Guitard the Reis in this instance, or will the Dryasdusts with a keen nose for "first, original and only" hark farther back?

A SUBSTITUTE has long been wanted for india rubber and gutta percha, and the search after it has not been languid. Attention has again been drawn to the subject by the publication of the report of the Government botanist of British Guiana on balata and the balata industry. To most people the word "balata" has an unfamiliar look. This substance is obtained from the bark of the bullet tree, found in the West Indies and the Northern regions of South America. The tree is a large one, grows chiefly in marshland, and is said to yield freely, though the supply is limited. Balata commands a higher price than gutta percha, and has the advantage of changing but slowly when exposed to the air and light. Moreover, it is somewhat softer at ordinary temperature, and is not so rigid in the cold. It is not liable to stretch under tension, and hence is said to be "unequaled" for bands for machinery. The statement is made that collecting balata is known only as a regular industry in Berbice, but we are informed that an American firm has acquired a grant of several hundred thousand acres for the purpose in Dutch Guiana. Operations thus far have been confined to the banks of the rivers of Guiana, the collectors rarely penetrating more than a mile or two into the forests. One American firm of manufacturers is quoted as affirming that the balata is "the best gum in the world," and there seems little cause to doubt that a very useful substitute has been hit upon. And yet balata is hardly new to the arts, having been brought to notice, as superior to india rubber or gutta percha, in 1862. Possibly the tree is as susceptible of regular cultivation as cinchona or coffee. It is said that the insulating properties of balata are very superior.

FOOLING WITH THE PHONE.

Strange sounds come floating to my ear,
Sounds with a meaning all unknown,
Sometimes but murmurs soft and low
That ere they pierce my ear have flown.

I hear loud curses mixed with songs,
I hear the lover's sighing tone,
Like zephyrs from the South they come,
Sometimes a sob comes, or a groan.

I cannot tell what mean these sounds,
These curses, sighings, songs and groans,
I simply draw my pay each week,
I'm "Central" fooling with the phones.

—*Minneapolis Tribune.*

Telephone Litigation at Newark, N. J.

Vice-Chancellor Bird, of New Jersey, rendered his decision in the Newark telephone case, at Newark, on Aug. 26. This is an application of the Domestic Telephone Company, of Newark, for an injunction restraining the Metropolitan Telephone Company, of New York, from interfering in any way with the business or interests of the Newark company in Newark, pending the decision of the Chancellor on the amended bill of the Newark company for a mandamus to compel the Metropolitan Company to renew the contracts for the exclusive use of the Bell Telephone in that city. The case has already been decided against the Newark company, which decision was upheld by the Court of Appeals, but a rehearing of the case is to be had on the ground of new testimony.

In his decision, the Vice-Chancellor said that the injunction prayed for is granted, and that the defendants are restrained from interfering in any way with the business of the Domestic Company of Newark pending the decision of the Chancellor in the case of the amended bill. The complainants are to continue paying the tolls and rentals to the defendants' company pending such injunction, although the payment and collection of such tolls and rentals is not to prejudice the case on either side.

The Vice-Chancellor said that he granted the injunction largely on the strength of the affidavits offered by the plaintiffs, and while he was very much impressed by the motion of the defendants to rule them out, owing to some little irregularity, the necessity of considering them was so great, and their bearing on the case was of such vital importance, that he felt constrained to accept them. He said that in granting the injunction he was largely influenced by the consequence that might follow to the company and to the community at large if no injunction were granted.

A New Electrical Lock.

The rapid increase in the number of apartment and flat houses has created a demand for means by which unauthorized persons are prevented from entering the apartments. Heretofore this has been accomplished by employing mechanical means and wire pulls, but it has remained for Mr. Allen, of Boston, to solve the problem in an electrical way.

In outward appearance the lock employed by him does not differ from the ordinary. Its internal construction, however, is a very ingenious arrangement, and is shown in the accompanying illustration.

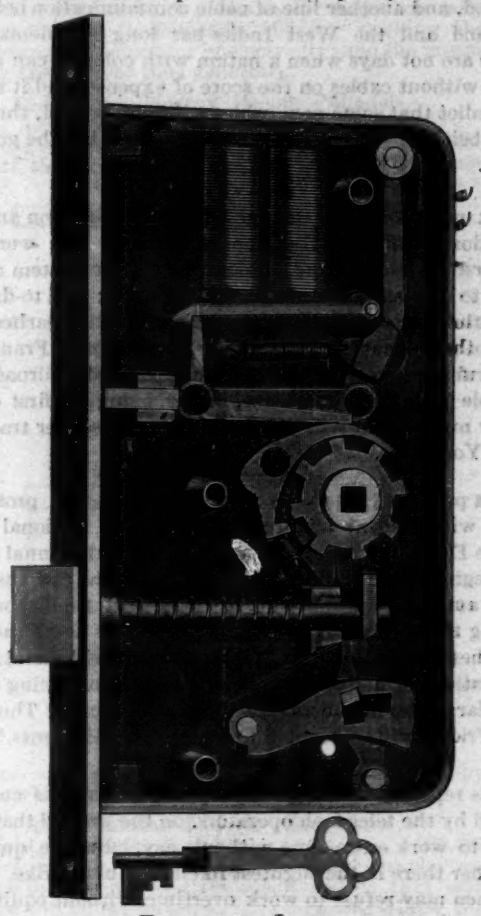
The object for which the lock is designed is to permit of its being operated by a person in an upper story, or placed at any desired distance, the mere pressure of a push-button being sufficient to effect this.

The spindle upon which the door-knobs are mounted is of the description called the swivel spindles; these, as is well known, are composed of two portions connected by a swivel-joint, so that each can be rotated independently of the other. The inside knob is permanently connected to that part of the spindle which carries a tumbler. This will be seen to press against the projection at the rear end of the latch-bolt. Thus a turn of the inside knob always opens the door as usual. The part of the spindle connected to the outside knob carries the toothed wheel shown, which can be turned continuously without effecting anything.

Pivoted to the tumbler above mentioned will be seen a "dog" or ratchet, which is held out of contact with the toothed wheel by the pressure of the lower arm of a bent lever, and this bent lever in its turn is held in its position by the "catch" at the end of the armature pivoted before the electro-magnet shown. In this position the turning of the knob from the outside cannot open the door. When the electro-magnets are energized, however, the armature is attracted and the bent lever released. The spring attached to the ratchet then forces the latter against the toothed wheel, and now, by turning the outside knob, the tumbler to which the ratchet is attached is forced against the latch bolt, as usual, and opens the door.

It will be noted that the bent lever is pivoted to a horizontal bar which slides on a bearing at the left, and is attached to a vertically suspended bar at the right. This vertical bar extends downward between the tumbler and the projection on the latch-bolt, and is held in position by a spring. The electric impulse having released the armature, it must be brought back again to its original position and this is accomplished by the vertical lever. Being forced back similarly to the latch bolt, it takes the bent lever back with it and allows the armature to drop into its original position. This also forces the ratchet out of contact with the toothed wheel, which now again turns freely. Thus the very act of opening the door restores the lock to its original position ready for the next caller.

It is evident that the push button may be placed at any



ELECTRICAL LOCK.

desired distance from the lock, and the latter is provided with a key, operating in every other respect like an ordinary lock. The Boston Electric Company has the sole control of the lock, the patents for which were issued last month.

Carhart Cable Clip.

To obviate the inconvenience of stringing a large number of single wires, telephone companies have had recourse to cables which, containing a large number of wires, are

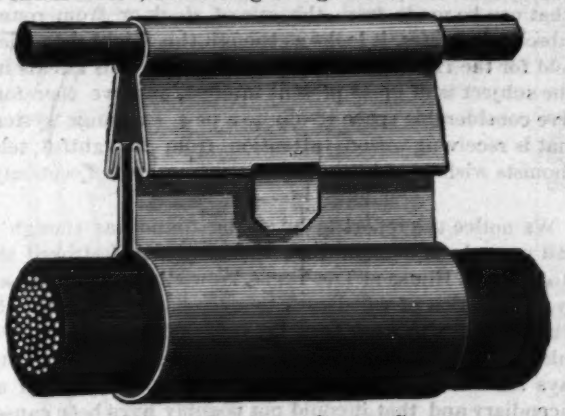


FIG. 1.—CARHART CABLE CLIP.

suspended on a single supporting wire. One of the clips recently designed for this special purpose is that shown in the accompanying illustrations. Fig. 1 exhibits the clip as arranged for duty. Its detailed construction is shown

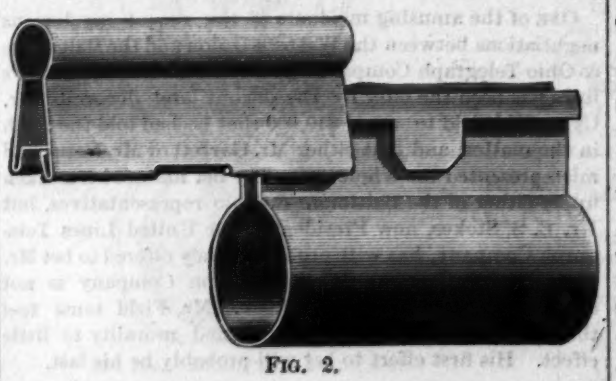


FIG. 2.

in Fig. 2. It will be seen to consist of two parts. The upper one, encircling the supporting wire, has its lower edges bent inwards, the metal being cut away at the centre of the bend. The lower half, which encircles the cable has its upper ends bent outwardly, and in addition has a tongue on each side. By this means, the lower half, being raised, can be slid into the upper, and when the tongue meets the cut in the bend it falls into the position shown in Fig. 1. The tongue now locks the two together and prevents their separation. By this peculiar construction the clip can be removed and its position changed without in any way injuring it, as no parts need be bent in order to effect the locking

President Bates Explains.

But little new light has been thrown this week on the mysterious negotiations between the Western Union and Baltimore & Ohio Telegraph Companies. In our last issue we gave Dr. Green's explanation of certain details. Since then Mr. D. H. Bates has also discussed certain details. When his attention was called to various statements and reports, he said: "I have seen the statement which is credited to Mr. R. Stewart, formerly General Manager of this company, that the company is losing not less than $50,000 a month. It seems to me that a denial of such a ridiculous assertion would be superfluous. It may be possible that with Mr. Stewart as General Manager the company did lose $50,000 a month. But, inasmuch as Mr. Stewart has not been connected with the Baltimore & Ohio Telegraph Company since the close of 1883, he certainly cannot know what the company's present business is, nor what its earnings are. The growth of this company's business during the last two years has been very great."

The statement that ex-Attorney General C. J. M. Gwinn, of Maryland, was the "distinguished person" to whom Dr. Norvin Green mysteriously referred several weeks ago as having approached the Western Union people as a representative of the Baltimore & Ohio Telegraph Company, with a view to making a combination, was brought to Mr. Bates' attention. He said that Mr. Gwinn never had any authority to represent the Baltimore & Ohio Telegraph Company in any such negotiations. Mr. Gwinn, Mr. Bates said, had been counsel in Baltimore for the Western Union Company for about 20 years. For a short time he was also counsel for the Baltimore & Ohio Company, but he gave that up in consequence of pressure of other business. About two years ago Mr. Gwinn was employed by the Baltimore & Ohio Railroad Company to look after some special cases.

Edward S. Stokes, President of the United Lines Company, said on Monday last that he had read Cyrus W. Field's proposition to wager $10,000 that what he (Field) had said about the Baltimore and Ohio-Western Union negotiations was correct. This proposition Mr. Bates had declined to take up. "I have no interest in that matter," said Mr. Stokes, "but I will make Mr. Field a proposition. If an expert accountant, to be agreed upon by Mr. Field and myself, is permitted to examine the books of the Western Union Company, I will deposit $10,000 in any newspaper office that Mr. Field may name, to be given to the Grant Monument fund if the expert finds that the Western Union Company is actually earning 3 per cent. per annum on its stock. I don't believe that the Western Union Company is earning that much. Of course, if Mr. Field wishes to deposit $10,000 against my money, to go to the Grant Monument fund if I am right, he may do so, but I do not care whether he does so or not. My money is ready at any time." "What do you think of Mr. Field's assertion that no business man would pay $1,000,000 for the Baltimore & Ohio Telegraph lines?" inquired the reporter. "That is nonsense," was the reply. "I am authorized by a syndicate of capitalists to offer $4,000,000 for the Baltimore & Ohio Telegraph lines. I do not believe, however, that Mr. Garrett will sell. At any rate he would not sell for less than $6,000,000 or $8,000,000."

Raising Telephone Rates in New England.

Particulars have already appeared in these columns as to the proposed increase of telephone subscription rates in the territory of the New England Company. The new schedule is as follows:

In Cities having a Population of 20,000 or Over.

1st class, consisting of an exclusive private wire for each subscriber; $75 for business purposes, $75 for residence.

2d class, consisting of not over 2 subscribers per wire; $60 for each subscriber for business purposes, $50 for residence.

3d class, consisting of 3 or more subscribers on each wire; $50 for each subscriber for business purposes, and $40 for residence.

In Towns or Cities of Less than 20,000 Population.

1st class, (as above) $60 for business purposes and $60 for residence.

2d class, $48 for business purposes and $42 for residence.

3d class, $42 for business purposes and $36 for residence.

All of the above rates apply only to subscribers within one mile of the general office. An additional charge of 50 per cent. will be made for subscribers more than one mile and less than two miles distant, and a further mileage charge for subscribers whose location is more than two miles distant.

Reports of dissatisfaction come from other places than those previously mentioned. At Pittsfield, Mass., on Aug. 26, about a hundred business men met to take action in resisting the increase, taking effect Sept. 1. Manager W. J. Denver and Superintendent F. G. Daboll, of the New England Company, had an interview with a committee appointed by the meeting, but no concession was made by them. It is said that about thirty of the malcontents declared their intention to take out their instruments.

The Greenfield "Listening" Telephone Exchange System.

When the telephone became a thing of commercial value and the "exchange" became an established fact, the prospective profits were so great that special arrangements for economy were not considered. It soon became apparent, however, that as the number of subscribers increased, the operating expenses also increased, but in a much greater ratio, as is shown by numerous telephone statistics. To reduce this expense, therefore, and to place each telephone operator in a position to handle an increased number of wires, has led to the devising of numerous exchange systems, which, in their development, recall to mind the efforts which have been made to increase the capacity of telegraph lines.

The telephone exchange system which we describe today is one of great originality, and differs in many essential points from those now in use. Originally devised by Mr. Greenfield, it has been greatly improved by Mr. E. L. Bradley, of New York, so that it is now an eminently practical system.

As indicated by its name, the system is a "listening" one, in that no magneto or battery is employed to drop the

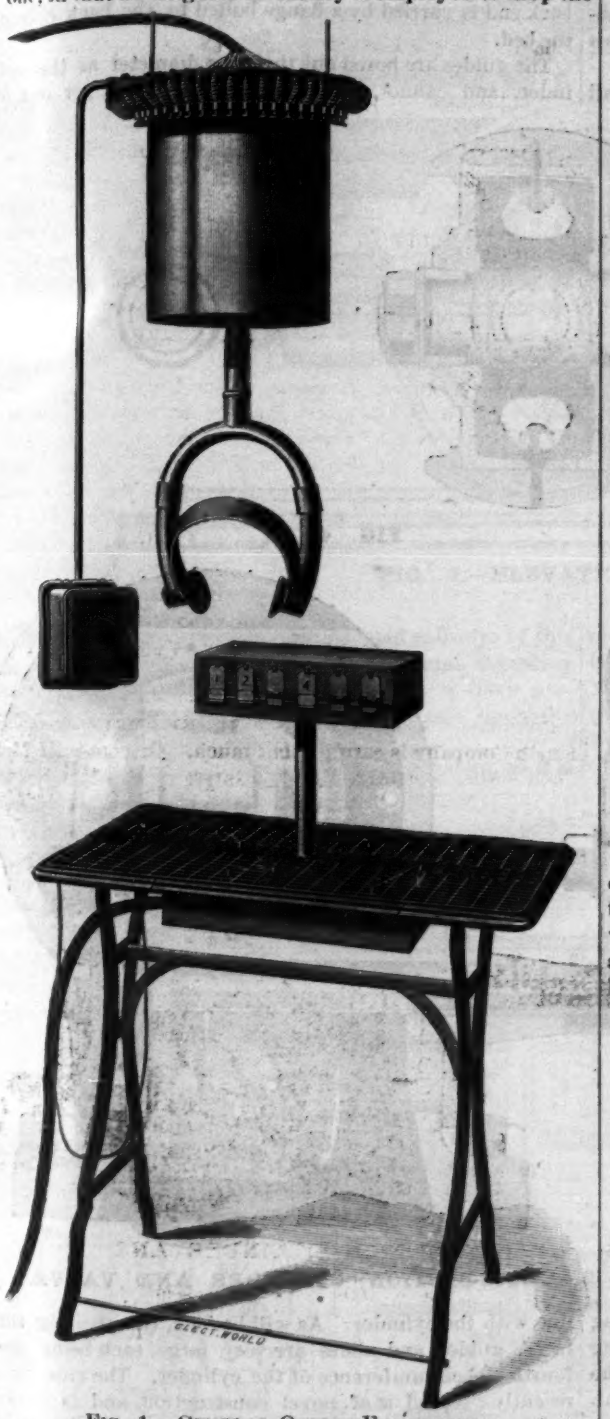


FIG. 1.—CENTRAL OFFICE EQUIPMENT.

annunciator at the central office. The subscriber speaks directly to the operator and makes his wants known. In other words, it is a "calling" system. In this respect it resembles the "Law" system, but the means employed for the purpose differ entirely from those of the latter, as no separate calling circuit is employed, the regular line being used for the purpose.

Before entering into a description of the details of the system, we may explain briefly that each subscriber communicates with the central office through the medium of a receiving telephone which is constantly at the ear of the operator, who makes the connections as desired.

Our engraving, Fig. 1, shows an installation as required for 400 subscribers. The horizontal switchboard is no larger than an ordinary sewing machine table, and four operators are seated about it—one on each side. Above each operator is suspended a "multiple receiver," through which the subscribers call the central office, and the table, in addition, carries a small upright and frame with the necessary annunciator drops on each side, the function of which will be explained presently.

[Our engraving shows only one "multiple receiver" suspended. In actual practice four would be required.]

The "multiple receiver" is shown in detail in Figs. 2, 3 and 4. It will be seen to consist of a number of telephone receivers arranged radially around a central tube K^3, which is prolonged downward and ends in the double ear-piece K^6, which reaches to the head of the operator. Flexible tubing is used so that the operator experiences no inconvenience. The individual receivers K^4 are placed at the end of tubes K_3, which radiate from the central tube, and thus, as calls are from time to time made, the vibrations of each diaphragm are transmitted directly to the

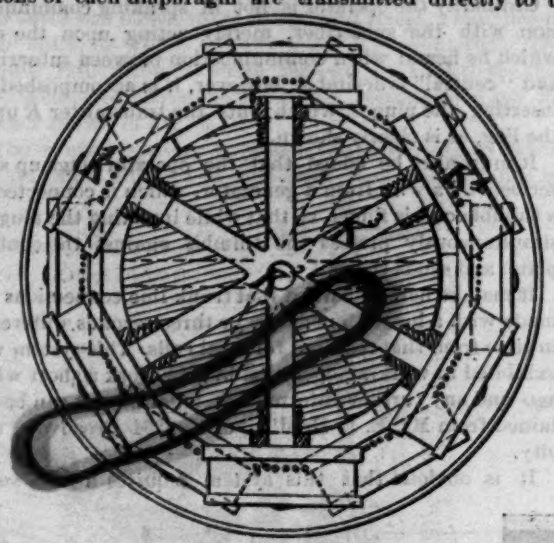


FIG. 4.—MULTIPLE RECEIVER, HORIZONTAL SECTION.

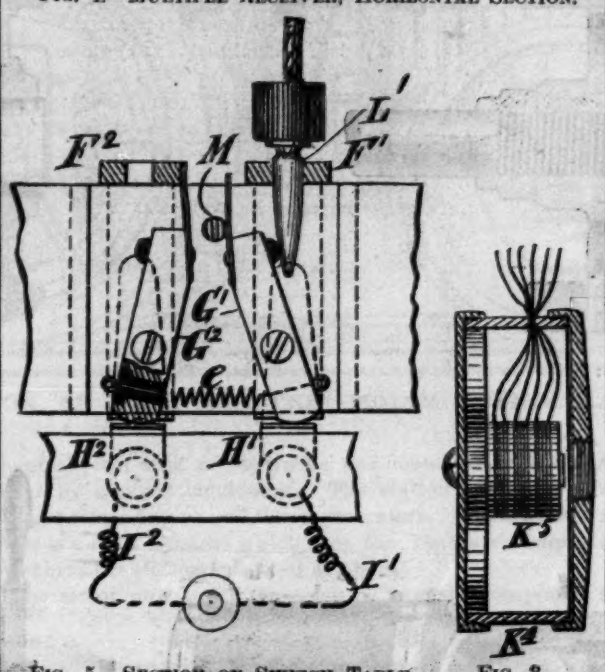


FIG. 5.—SECTION OF SWITCH TABLE. FIG. 3.

ear of the operator. As will be seen, the core-magnets of the individual receivers, Fig. 3, have three helices K^5 wound upon them, each of which is alike capable of actuating the diaphragm. The two terminals of each helix are connected respectively to the lines coming from

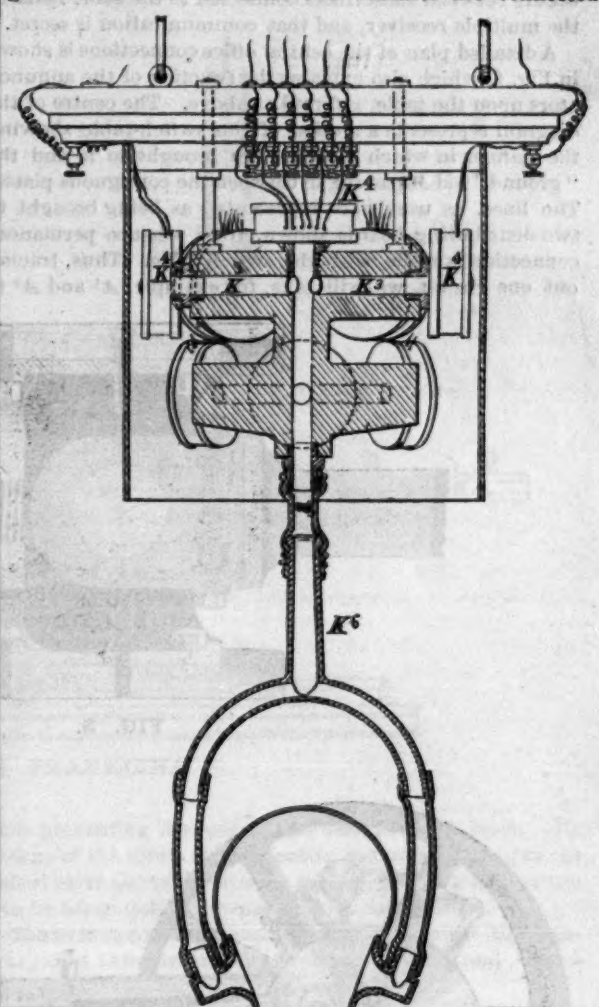


FIG. 2.—MULTIPLE RECEIVER, VERTICAL SECTION.

joined respectively to plates F^1 and F^2, which are placed directly opposite each other on the switch-table. Running along between these plates is a rod M which is connected to earth. Below the contact plates are two levers G^1 G^2, which swing on screw pivots; and the spring e, which is insulated from the levers, tends to press their ends apart. These ends, as will be seen, carry spring-fingers which are normally pressed against the contact plates—G^2, being shown in that position. On the side opposite to that on which the spring-fingers are attached, the levers carry insulating buttons against which the plug presses when inserted in the contact plate; as shown in the position of G^1. The lower ends of the levers bear against the spring contacts H^1 and H^2, thus insuring good connection. To these two contacts are connected the ends of one of the helices in the multiple receiver, which come in at I^1 and I^2. If no plug were inserted both levers would be in the position of G^2. The circuit would then be as follows: The line entering at F^2, is continued by the spring-finger through G^2 to H^2; then by

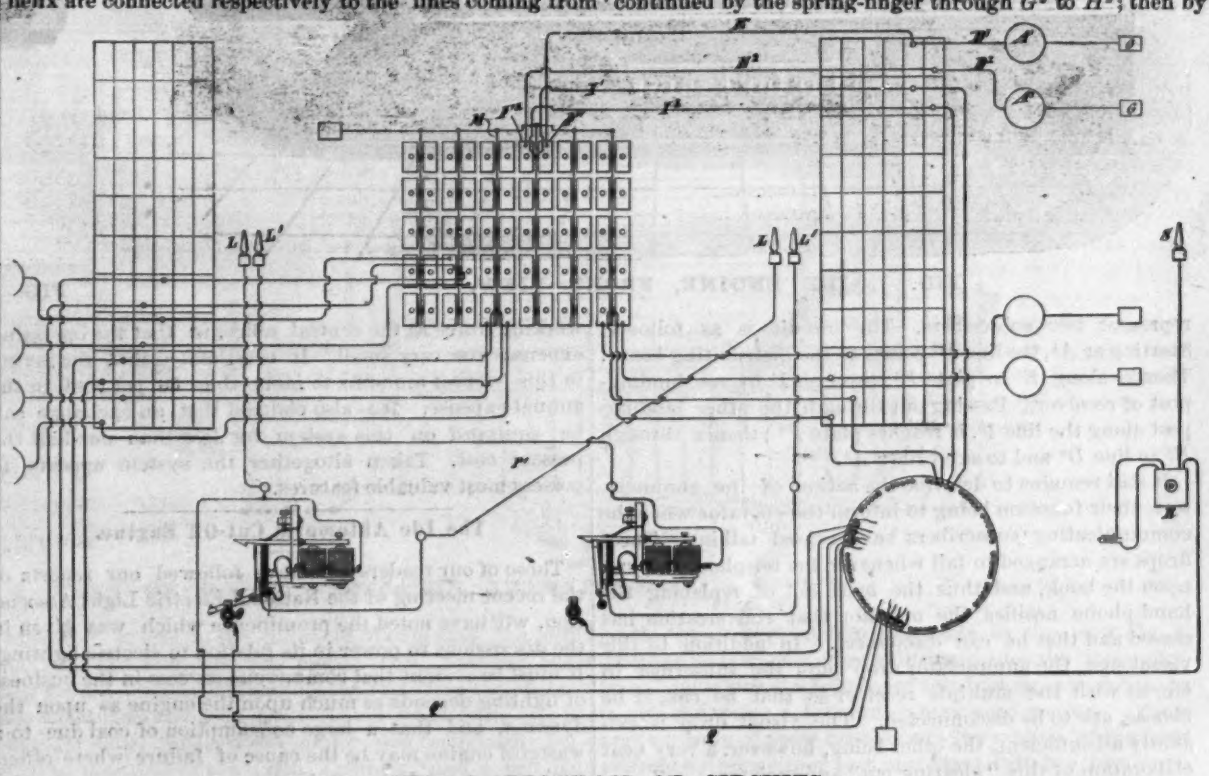


FIG. 6.—DIAGRAM OF CIRCUITS.

two subscribers, so that two subscribers use the same helix in calling "central." As there are three of these helices connected up in similar manner on each receiver, it is evident that six subscribers can "call" through a single receiver, so that 17 receivers, arranged as shown, will suffice for 102 subscribers.

In order to show the non-interference of two subscribers connected up in this way, we give a detail of the switch table, which shows a vertical section of it, Fig. 5.

Two subscribers whom we will designate as No. 1 and No. 2, connected to the same helix, have their lines

I^2 it passes through one helix of the multiple receiver back again to I^1, through G^1 to contact plate and out to line L^1.

It will thus be seen that when not in use the subscribers' lines are not grounded at the central office, but pass out unbroken through the multiple-receiver, being grounded only at the subscribers' stations. Upon the operator receiving a call for a connection from subscriber No. 1 he inserts a plug in the contact-plate F^1, and the plug at the other end of the connecting cord into the contact-plate of the party called. This gives the two direct,

connection. By the insertion of the plug, however, the lever G^1 is pushed away from the contact-plate and forced against the rod M, which is grounded. This operation serves the double purpose of cutting out the multiple receiver, so that the operator cannot hear the conversation carried on, and at the same time provides a means by which No. 2 can still call "central," although No. 1's circuit is busy. This is apparent from Fig. 5. The plug having cut line No. 1 out entirely, has put G^1 to ground through M, and the circuit is now as follows: The line entering at F^2, as formerly, has the same course through the multiple receiver, comes back through G^1, but instead of passing out to line L^1, goes to the rod M and to the ground. Thus it will be seen that no interference occurs between subscribers connected to the same helix of the multiple receiver, and that communication is secret.

A detailed plan of the central office connections is shown in Fig. 6, which also explains the function of the annunciators upon the table, referred to above. The centre of the diagram represents a section of the switch-table showing the manner in which the lines are brought to it and the "ground" rod M passing in between the contiguous plates. The lines, as usual, are represented as being brought to two distributing boards shown, from whence permanent connection is made with the switch-table. Thus, tracing out one circuit, we will take, for example, A^1 and A^2 to represent two subscribers. The circuit is as follows: Starting at A^1, the line D^1 comes to the distributing board. Thence along E^1 to plate F^1, through I^1 to one binding-post of receiver. Passing out through the other binding-post along the line I^2, it reaches plate F^2; thence through E^2 to line D^2 and to subscriber A^2.

It still remains to describe the action of the annunciators, their function being to inform the operator when the communicating subscribers have ceased talking. These drops are arranged to fall whenever the telephone is hung upon the hook, and thus the mere act of replacing the hand-phone notifies the operator that conversation has ceased and that he can disconnect. In addition to this visual sign, the annunciator drop puts the subscriber in circuit with the multiple receiver so that he can, if he choose, ask to be disconnected. The visual drop is evidently all-sufficient, the other being, however, a very neat elaboration of this "clearing out" annunciator.

The operation will be understood by referring to Fig. 6. We will consider two subscribers in conversation, connected by the plugs L^1 L^1 and the connecting cord which passes through the annunciator at the right. The speaking current does not affect the drop. The act of hanging up the telephone throws an impulse from the subscriber's battery (or magneto, if used) upon the line and drops the annunciator, as shown at the left, Fig. 6, this annunciator being connected to the plugs L L. It will be seen that the drop g, forms a contact at o with a circuit Q Q^1, leading to the multiple receiver. If we conceive the plugs L L inserted in the two plates F^1 and F^2, as they would be in practice, it is evident that either subscriber could now call for disconnection or make any other communication to "central." Whenever the operator sees the drop fall, he waits for no call but disconnects at once. There being only a sufficient number of drops and plugs for the subscribers that may wish to use the wires at one time (say 20 per cent. of the whole), the annunciators are arranged on a frame, as shown in Fig. 1.

Ordinarily the operator is not in speaking communication with the subscriber, merely acting upon the call which he hears; when communication between subscriber and "central" is desirable, however, it is accomplished by inserting the plug S, which puts the transmitter R upon the line, as is clearly shown.

It must also be added that the operator rings up subscribers by a wire from a generator, which is connected to a thimble on his finger, so that while inserting the plug he simultaneously presses the thimble against the contact plate, and sends the call.

It may be here remarked that trunk line connections are made with a loss of one, two, or three seconds difference in time from that required for local calls. This system was exhibited in working operation in New York a short while ago and any further information regarding it can be obtained from Mr. E. L. Bradley, of No. 234 Broadway, this city.

It is obvious that this system requires a very small working force at the central office, so that the operating expenses are very small. It is estimated that the saving in this respect amounts to more than 50 per cent. in the annual expense. It is also claimed that an exchange can be equipped on this system for less than one-half the present cost. Taken altogether, the system appears to possess most valuable features.

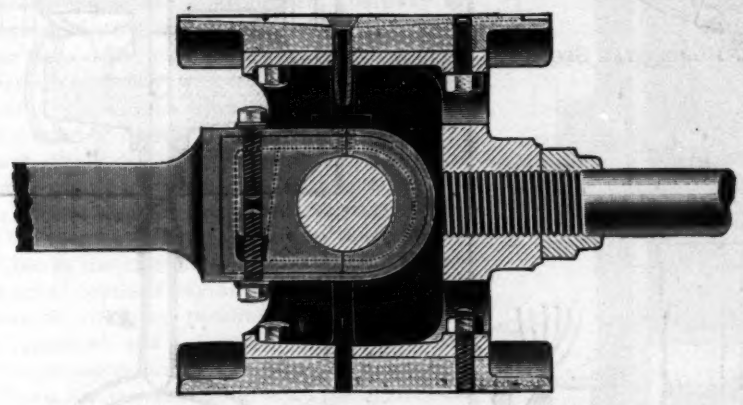


FIG. 3.

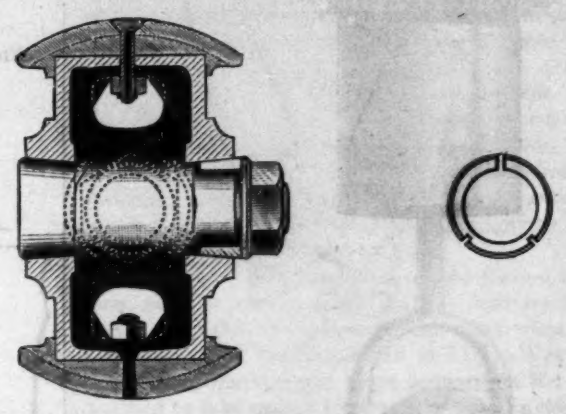


FIG. 4.

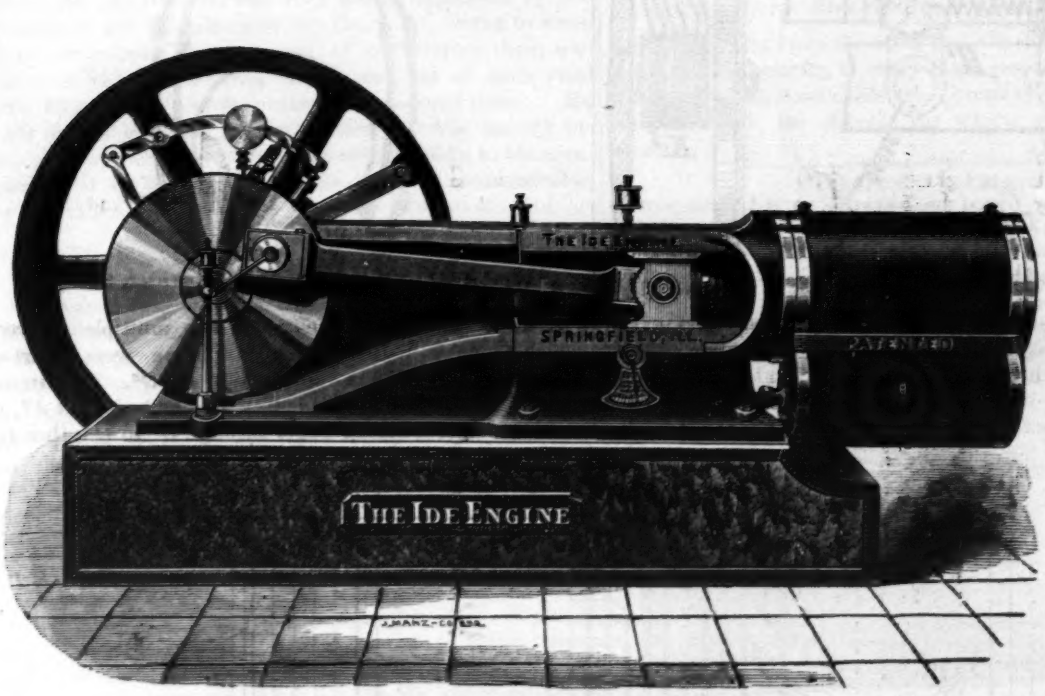


FIG. 1.—IDE ENGINE, FRONT VIEW.

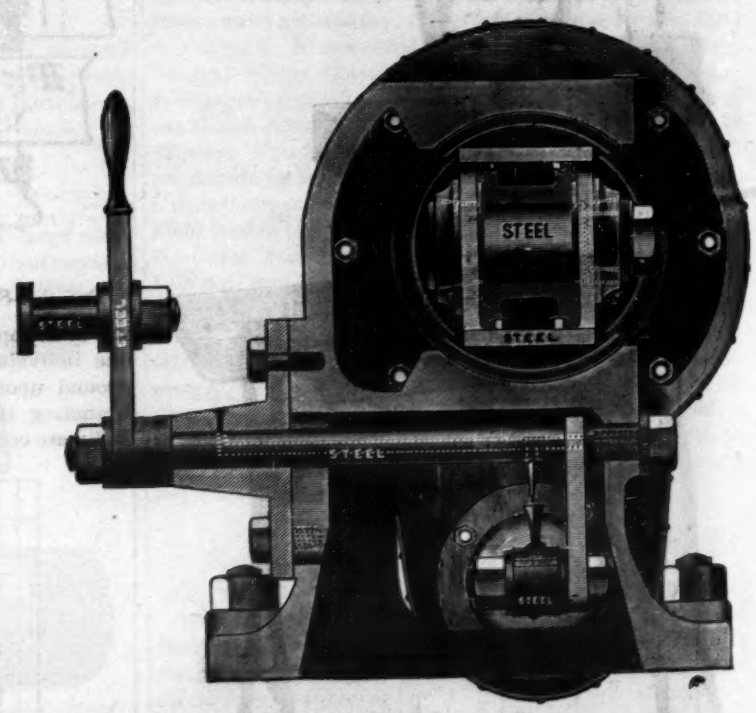


FIG. 2.—CROSS-SECTION, CYLINDER AND VALVE.

The Ide Automatic Cut-Off Engine.

Those of our readers who have followed our reports of the recent meeting of the National Electric Light Association, will have noted the prominence which was given in the discussions to power in its relation to electric lighting. It must be evident that commercial success in the business of lighting depends as much upon the engine as upon the dynamo, and that a large consumption of coal due to a wasteful engine may be the cause of failure where otherwise success might be attained.

We illustrate to-day the latest form of an engine which has attracted the attention of electric light men for some time past and the employment of which has given excellent results.

The Ide engine, a front view of which is shown in Fig. 1, is strongly built, all the working parts being of steel and bronze. The cylinder is secured to the end of the frame, and overhangs. This construction insures a perfect alignment of the working parts at all times, as the cylinder is free at the front end to expand when heated, and in so doing it does not put a strain on the engine frame or foundation, and cannot spring the frame and throw working parts out of line, the result of which is heating or breaking of parts.

Two important points are gained by placing the steam chest and valve below the cylinder. Only dry steam enters the cylinder from the top of the steam chest, and all water will pass off at the opening in bottom of the steam chest. The steam ports being on bottom side of the cylinder, all condensation in cylinder passes directly out with the exhaust steam.

The valve is of the piston form and its position with regard to cut-off is shown by the novel indicator recently patented by Mr. Ide and shown at the front of the engine in Fig. 1. The hand or pointer of the indicator is applied to the end of the "rock shaft" actuating the valve, and is so arranged as to move over a scale marked to indicate the inches of steam in the cylinder at the moment the steam is cut off. This indicates to the eye at all times the condition under which the engine is operating, and thus enables the boiler pressure to be regulated so as to obtain the best results with the greatest economy in the use of steam.

Fig. 2 shows a cross-section of the bed through the slides. The rock shaft is a steel casting, with the lower arm that drives the valve cast on. The shaft is supported at the front end by passing through the front side of bed, and the back end is carried by a flange bolted to the back side of the bed.

The guides are bored out the same diameter as the cylinder, and cannot, under any circumstances, get out of line with the cylinder. As will be seen, the wearing surfaces, guides and slides are very large, each being one-fourth the circumference of the cylinder. The cross-head recently adopted is of novel construction, and is shown in Figs. 3 and 4. It will be observed that the attachment to connecting rod is central on cross-head, avoiding thereby any buckling strain on piston-rod by the angular thrust. This construction will also admit of the hardened steel pin, which is not only conducive to long life, but makes it possible to dispense with the loose strap on connecting-rod. The method of securing the pin to the cross-head is a novel one, and for which a patent was recently granted to Mr. Ide. The pin is steel, with the same taper on both ends; the cross-head is bored with a reverse taper on the nut side; a split ferrule or sleeve is bored to fit pin and turned to fit cross-head; as the nut is drawn against the washer, the sleeve is forced into the cross-head firmly pinching the pin.

Perfect regulation being the great desideratum in an electric light engine, special attention has been bestowed upon this feature. The automatic cut-off governor is secured to the side of band wheel, and connects through eccentric on main shaft direct to rock shaft without the use of gearing, pulleys, shafts or belts. It is attached to the valve direct, and gives an open port at the beginning of each stroke, admitting steam to piston head at full boiler pressure, and varies the point of cut-off as the resistance requires, from the beginning, to three-fourths of each stroke without changing the lead. It acts instantly, and cuts off the steam at a point that will just do the work and maintain the fixed speed of engine. The speed remains constant, regardless of the change of load or variation of

steam pressure in boiler, and the variation in speed from no load to the full power of the engine is less than two per cent.

All the minor details which go to make up a reliable engine have been carefully worked out, lubrication especially having been well provided for. A large number of electric lighting stations employ this engine for their motive power and the results obtained are very satisfactory.

The Daft Electric Motor on the New York Elevated Railroad.

It may be safely asserted that no engineering event within the last few years has attracted popular and professional attention more than the present trial of electricity as a motive power on the elevated railways of this city. The daily papers have printed columns regarding the event, and a number of illustrated papers have produced illustrations of the motor which is now upon the tracks.

Before entering into a description of the system, as it is operated, it may be well to recall the events which have led up to the present state of affairs.

The idea of running the elevated railway trains by electricity was broached several years ago, the many strong points in its favor, over steam, being pointed out. Nothing, however, was done in the matter beyond its mere discussion, until the early part of this year, when at a meeting of the various electric motor companies, an attempt was made to consolidate their interests, and to test the motors of the various companies represented. A commission was to be appointed (Sir William Thomson being designated as one of them) to test the motors, and the best system was to be adopted. Several meetings were held, but the scheme finally fell through. This agitation acted as a stimulus, however, for shortly afterward the Daft Company obtained permission to equip a section of the Ninth Avenue Elevated Railway on its system, while the Edison-Field interests were assigned to the Second Avenue road.

From that time until now, a period of six months, the Daft Company has been busy equipping a central station, building a motor and laying down the central rail required. It must be understood that the latter operation had to be performed during regular traffic hours, with trains passing every five minutes or less.

The road is equipped from the elevated railway station at Fourteenth street, up to Fifty-third street, a distance of two miles, in which a heavy grade is encountered. The central rail, through which the current is led to the motor, is elevated above the outer ones, resting upon the insulator shown in Fig. 3.

The central station, in which the generating dynamos are placed, is situated in Fifteenth street, a distance of about 250 feet west of the tracks, and connected with the latter by a stout conductor. The station contains a Wright steam engine and three generators. In addition, there is a small dynamo which runs the Daft arc lamps, by which the station is lighted at night.

The motor now upon the tracks is named "Benjamin Franklin." It was on the night of Wednesday, the 26th inst., that the first run was made. This, however, was only for the purpose of cleaning the rust from the central rail, which had become heavily coated while lying idle so long. A small independent motor was temporarily fastened to the front of the "Ben Franklin," and a belt led to an emery wheel which, being applied to the track, removed the rust and left a bright surface. We were present upon the occasion and in the cab of the motor when the signal to start was given. The regulator being set at slow speed, the motor started without a tremor. Indeed, so gentle was the start that we hardly knew it had taken place before we found ourselves moving. The track-cleaning process was necessarily a slow one, and the motor was at no time run above "slow speed." On subsequent nights, however, a speed of 20 miles an hour was attained.

Our illustrations show the arrangements of the motor in detail, as it stands on the track, the cab being removed for the sake of clearness.

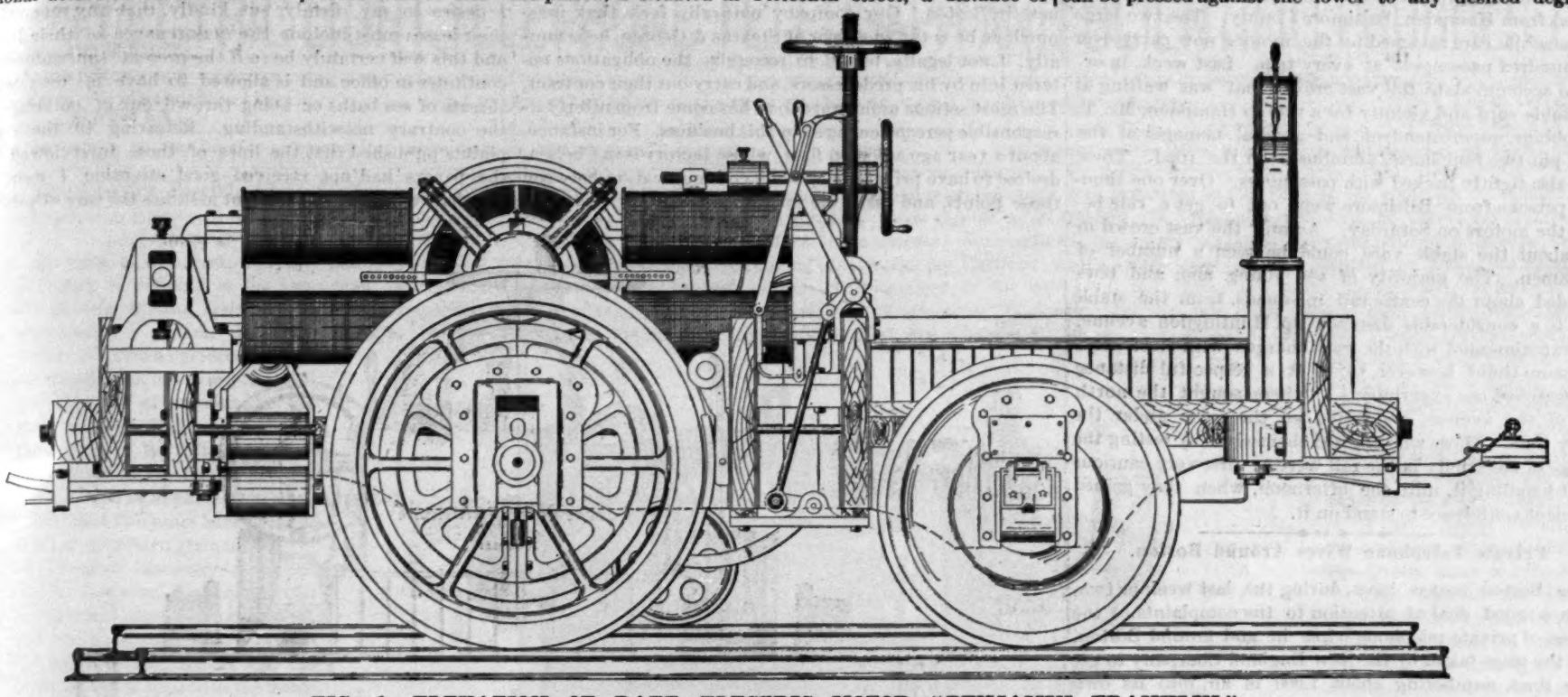


FIG. 1.—ELEVATION OF DAFT ELECTRIC MOTOR "BENJAMIN FRANKLIN."

In the arrangement of his motor Mr. Daft has entirely avoided the use of belts, power being transmitted by friction from the armature to the drivers, and the amount of it can be regulated at will according to the load. As will be seen from the plan, Fig. 2, the motor-dynamo is supported at the rear on a shaft resting in bearings; its front end is supported by a threaded eye through which passes a long screw, which is turned by a hand wheel, as shown in the side-elevation, Fig. 1. The armature shaft carries a friction wheel 9 inches in diameter, which bears upon a larger friction wheel 3 feet in diameter, keyed to the axle of the main drivers. With this arrangement it is obvious that by turning the large screw the upper friction wheel can be pressed against the lower to any desired degree, thus preventing slip, even with the heaviest loads. By means of the screw also the entire motor-dynamo can be raised clear above the driving wheels, so that the armature can be taken out and inspected with convenience.

The bronze contact-wheel which bears against the central rail is 15 inches in diameter and is raised and locked

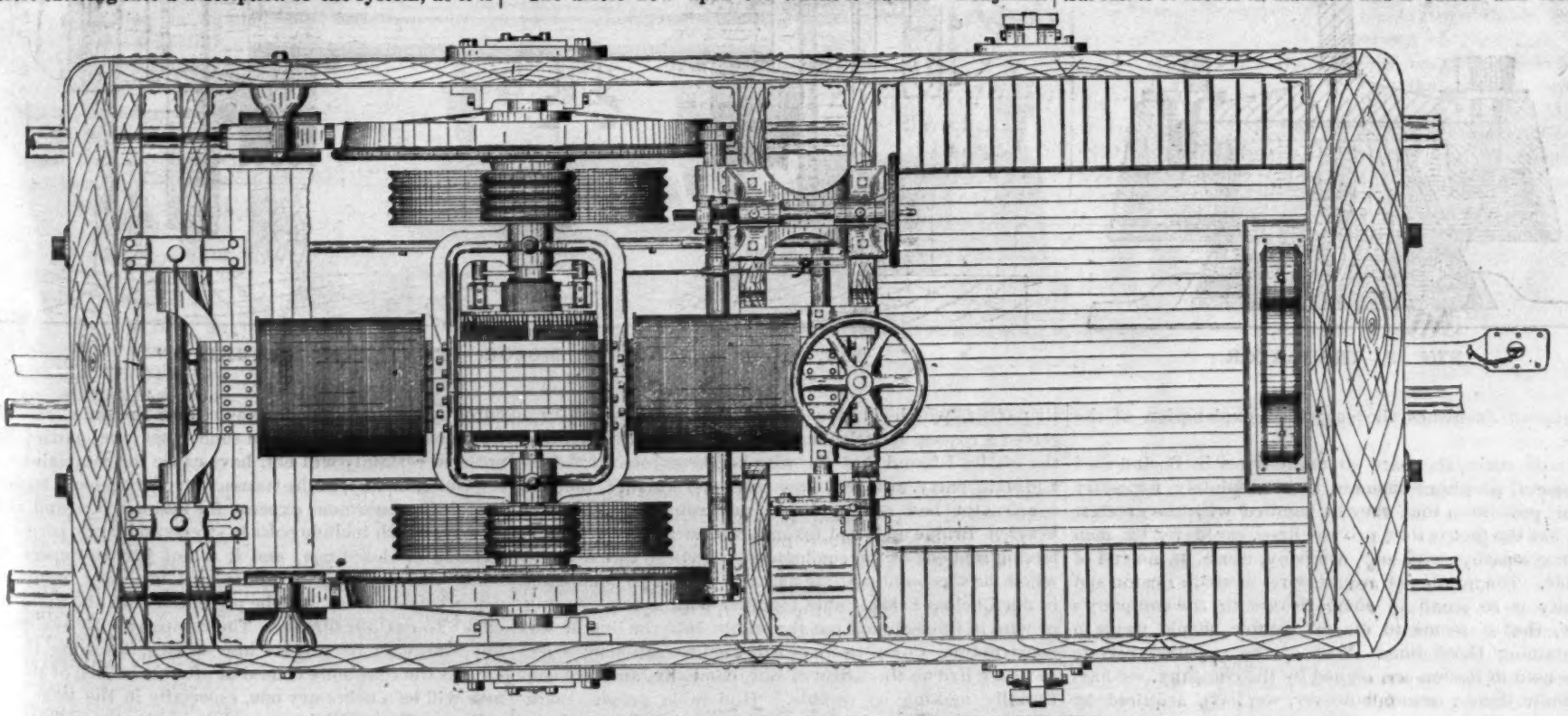


FIG. 2.—PLAN OF MOTOR "BENJAMIN FRANKLIN."

by the two levers at the near side in the view Fig. 1. Another lever on the other side constitutes the "reversing-lever," by which the brushes of the dynamo are set so as to give the motor a forward or backward motion. There are two pairs of these brushes and the motion of the lever alternately puts either pair in contact with the commutator. Like all of Mr. Daft's railway motors, this one is provided with his electric brakes. These consist of large electro-magnets which, being energized, are attracted by the wheels and press against them like the ordinary brake. The motor-man occupies the clear space in front of the motor-dynamo, and before him is placed the case containing the regulating, brake and cut-off switches, as shown in the end view, Fig. 4. The switch at the right controls the brakes and that to the left makes or breaks the current as desired. In the centre is placed the "regulator," by which the speed of the motor can be altered at will. There the terminals of the compound winding of the motor-dynamo are brought, and by bring-

ing the lever to the different notches the resis tance of the field-magnet coils is altered, which changes the speed correspondingly. The driving wheels are 48 inches in diameter, the trailing wheels being 36 inches. Their shafts supporting the motor-dynamo rest in specially designed resilient bearings, so as to reduce the shock to a minimum.

The motor is designed for 75 horse-power, and a norma speed of 18 miles per hour, with a possible speed of 40 miles. The motor complete weighs nine tons, and measures 14 feet 6 inches in length, over all.

Baltimore's Electric Railway.

The Baltimore Daft electric motors "Morse" and "Faraday" are doing a prosperous business transporting passengers to and from Hampden, Baltimore County. The two large Cantonsville cars attached to the motors now carry over one hundred passengers at every trip. Last week, in order to accommodate the vast crowd that was waiting at the stable yard and vicinity for a ride to Hampden, Mr. T. C. Robbins, superintendent and general manager of the road, put two four-horse omnibuses on the road. These were also tightly packed with passengers. Over one thousand persons from Baltimore went out to get a ride behind the motors on Saturday. Among the vast crowd in and about the stable yard could be seen a number of Chinamen. The majority of the young men and boys crowded about the centre rail in squads, from the stable yard to a considerable distance up Huntingdon avenue, and experimented with the rail charged with electricity. The more timid, however, stood at a respectful distance and watched the experiments. Others sought the north side of the avenue, and rested on the grass under the shady trees. Those who amused themselves by testing the charge of electricity in the rail were at first very cautious about handling it, until the afternoon, when they gained sufficient confidence to stand on it.

Private Telephone Wires Around Boston.

The Boston papers have, during the last week or two, given a good deal of attention to the complaints of the owners of private telephone wires in and around Boston, as to the steps taken by the New England Company to get those lines, numbering about 1,000 in all, into its own hands. Mr. A. A. Chapman, superintendent of that

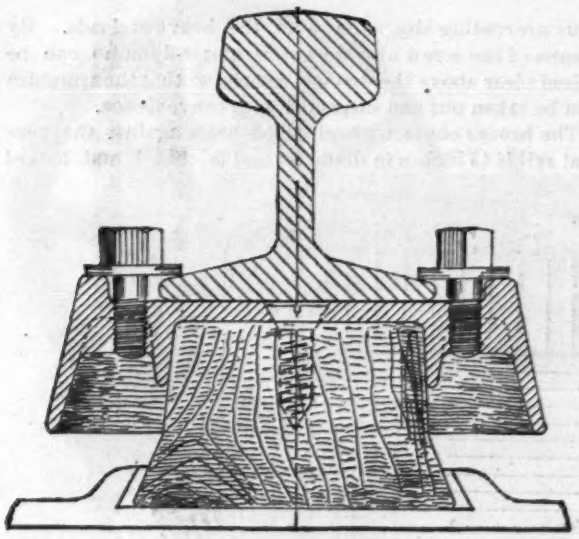


FIG. 3.—INSULATOR.

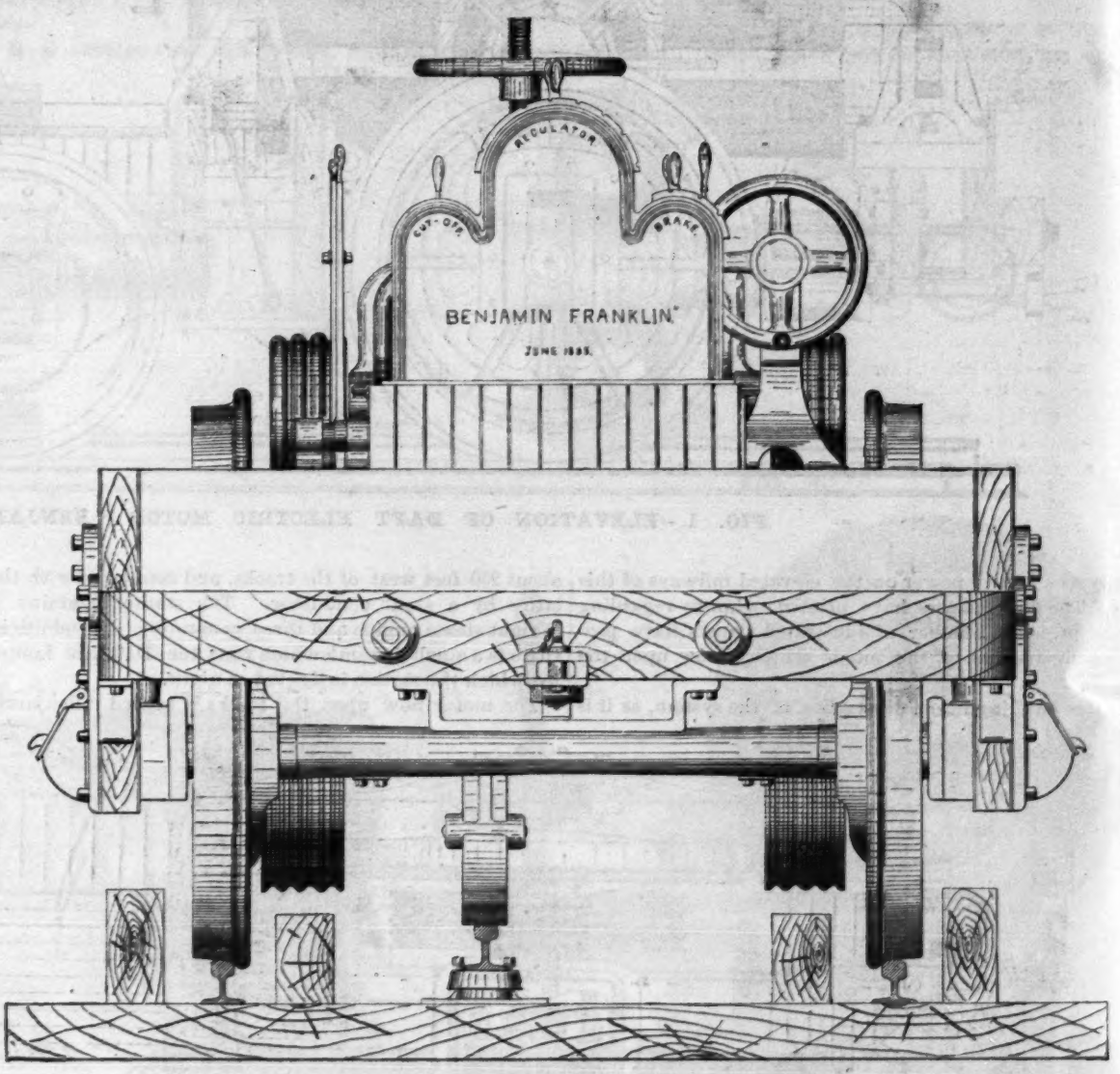


FIG. 4.—END VIEW OF MOTOR "BENJAMIN FRANKLIN."

department, furnishes the subjoined explanation of the case:

"In the main, there are so many wires in Boston used for general telephone business, it is absolutely necessary for our protection that they be handled with the greatest care, but the fact is that private lines, cared for by men not in sympathy with our company, cause us no end of trouble. The number of private wires in use in Boston and vicinity is so small in comparison with the company's wires, that it seems to me no trouble should result in maintaining those lines. Most of the so-called private wires used in Boston are owned by the company, we having built them; some, however, we have acquired by purchase. There are about 900 private wires in this city, three-fourths of which we own; of the 250 or so that we do not own, the company maintains, either by contract or by 'special order,' all but about 50, these latter being cared for by private individuals. The vital point to our company is, we do not make any money out of the maintenance of the private lines we do not own, and were it not for the fact that outside parties in caring for individual wires seriously interfere with our regular business, we would not trouble ourselves in the matter at all. In 1879, when I took charge of the private line department of the company, there were not more than seven or eight firms or individuals engaged in the construction and maintenance of private wires. As the exchange business developed and the number of wires necessary to do the business began to multiply, it was found that the private line business, handled as it was by hostile parties, was a serious detriment to the efficient working of the general exchange. It was for this reason, mainly, that the private wire department was organized as a separate feature. At the time I was appointed to my present office the principal part of the private line business was done by Messrs. Stearns & George and Charles Williams, Jr.; others, however, were engaged in a small way. Since then, this department has been reorganized, and the business and property—including fixtures, and the good-will of all the parties then engaged in the private wire business—have been purchased by the telepone company. Messrs. Stearns & George were paid, in cash, more than 10 times a fair valuation of their business. To our company they gave a bond that they would discontinue the business of building and maintaining private telephone wires within 15 miles of the city of Boston, forever. Mr. Charles L. Bly, 37 Pearl street, is the successor of Stearns & George, and he is now the only party doing any private line business in Boston. Our company naturally feels that, inasmuch as he is the successor of Stearns & George, he is morally, if not legally, bound to recognize the obligations entered into by his predecessors, and carry out their contract. The most serious annoyance to us has come from utterly irresponsible persons engaged in this business. For instance, about a year ago a Boston firm, whose factory is in Chelsea, desired to have private telephonic communication between those points, and asked me for the rental of a wire and instruments, which I gave them; shortly afterward, I received a request for telephones only. Upon investigating the matter I found that the wire had been constructed by a private party, at a very low cost; and further, that the constructor had stolen one of our submarine cables at Warren Bridge and had taken it to Charles River Bridge, having sold one of the conductors therein to the firm for whom he was building. He had also taken two conductors in our Chelsea Bridge cable, together with nearly one mile of wire in Chelsea, and put the whole into the line he was constructing. Competitors of this kind we seriously object to; they live on the skirts of our company, and are continually making us trouble. Honorable people, maintaining lines for private individuals, who do not desire our company to do their work, we would have no fault to find with. Another instance, although not so dishonest, occurred last spring, and was that of a firm which desired to connect two points, making it necessary to run their wires over Quincy Market. An individual (not the one alluded to above) took the contract to do the work at a rate much less than our company could afford to do it. Upon looking into the matter, I found that he had used our fixtures nearly all of the way, especially some new fixtures on the market, which we had recently put there at an expense of over $600. These are sample cases of what has been occurring in the past, and our company feels that it is fully justified in declining to lease telephones to be used on wires which it does not own or control. The company at this time does not construct lines for sale, but we are willing to lease lines and instruments to such parties as wish them, providing we have the maintenance of the wires. We are prepared to purchase private wires, and will pay full value for the same.

"In the case of one of the complainants, who said I had offered him $50 for his line, which cost $400 to construct, and he had refused the offer, I would say that the line, for our purposes, supposing we were to connect his various stations anew, would not be worth one-half the amount I offered, the reasons being, first, that his wires are now six or seven years old, which is about the life of the average wire in the city of Boston; and second, that if we should build a new line, we would put it on our present permanent fixtures, and those which he is now using would be of no earthly use to us. We certainly desired the care of his lines, and our arrangement with him will, I think, prove a perfectly satisfactory one to him when he has had time to cool his disturbed spirits. In regard to other parties whose contracts and leases of instruments have not yet expired, I desire to say, firmly, but kindly, that any renewal of their leases must include the maintenance of their lines, and this will certainly be so if the present superintendent continues in office and is allowed to have his own way, threats of sea baths or being thrown out of buildings to the contrary notwithstanding. Referring to the complaints published that the lines of those interviewed by the papers had not received good attention, I want to say that, when my department assumes the care of private wires by contract, we give these lines the same care that we do our own lines, and in such cases the parties have not, and certainly will not, have cause for complaint.

"Our company, in the transaction of its general business, is under an enormous expense for maintenance and rights of way, which include poles in streets and large, permanent fixtures on buildings; and it is not just to expect that, while the company is under this necessity, individuals using private lines will be presented with the knife with which to cut our throats. The company fully realizes the importance of its private line service, knowing that, so long as the telephone is used at all, this branch of the business will be a necessary one, especially in the large cities, and no effort will be spared to make the private wire service thoroughly efficient; but to do so we must do it in our own way. I anticipate no trouble in this matter, for I feel that in a half hour's conversation with a reasonable and intelligent owner of a private line I can convince him that the company's demands are not only fair, but are such as any business man would exact. With large corporations, using many instruments, I anticipate no trouble—in fact, less annoyance than from private individuals, for the former, to use the vernacular of the street, 'know how it is themselves.' Of the legality of the matter at issue I have nothing to say, not being a lawyer; but I seriously doubt the necessity of carrying the question to the courts, as I am fully convinced that all parties will see and realize the justice of the demands made by our company."

Picked Up.—A dispatch from Duxbury, Mass., announces that the steamer Minia, Capt. Trott, has picked up both ends of the French cable of 1869, and will probably make the final splice this week. This cable was broken about the middle of June.

ELECTRICAL REVIEW

[ILLUSTRATED.]

A WEEKLY JOURNAL OF

ELECTRIC LIGHT, TELEPHONE TELEGRAPH AND SCIENTIFIC PROGRESS.

(Formerly Review of Telegraph and Telephone.)

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The Schuyler Electric Light System.

RE-ORGANIZATION AND PROGRESS OF THE COMPANY.

In view of the fact that the Schuyler Company is stepping to the front rank of the electric lighting fraternity, and rapidly introducing a system, the many excellent points of which deserve special commendation, its description will doubtless be of interest to the readers of the Review, both for the novelty of its features, and as an exhibition of the recent advances made in applied electricity.

The past two years have brought forth much golden grain in the field of practical discovery much of which, however, for commercial reasons, still remains unchronicled, and we must turn to the central lighting stations, examine into the construction of apparatus, the methods of operation and regulation etc., before we can fully realize the great progress that has been made.

It is one thing to *devise* a system of electric lighting, but quite another to conceive and put into *practical* operation one that will realize the proper claims to satisfactory results as regards economy and reliability. Fully alive to the enormous strides being made in the applied sciences, and to the necessity of keeping equal pace, no expense has been spared, either for experiment or the application of its results. It has been the good fortune of this company early in its history to engage the services of Mr. Gustav Pfannkuche, formerly of the Pilsen-Joel Electric Light Company, of London, England, an electrician of the most modern school, who had thorough practical training in the work of designing and conducting electrical plants as well as a very high theoretical knowledge. His inventions were already important and very successful, strikingly marked by a practical character, and utilizing effectively principles that were only half understood, if understood at all, up to that time. He became the chief electrician of the company and with able assistants added immensely in a short time to the value of the company's machines and lamps.

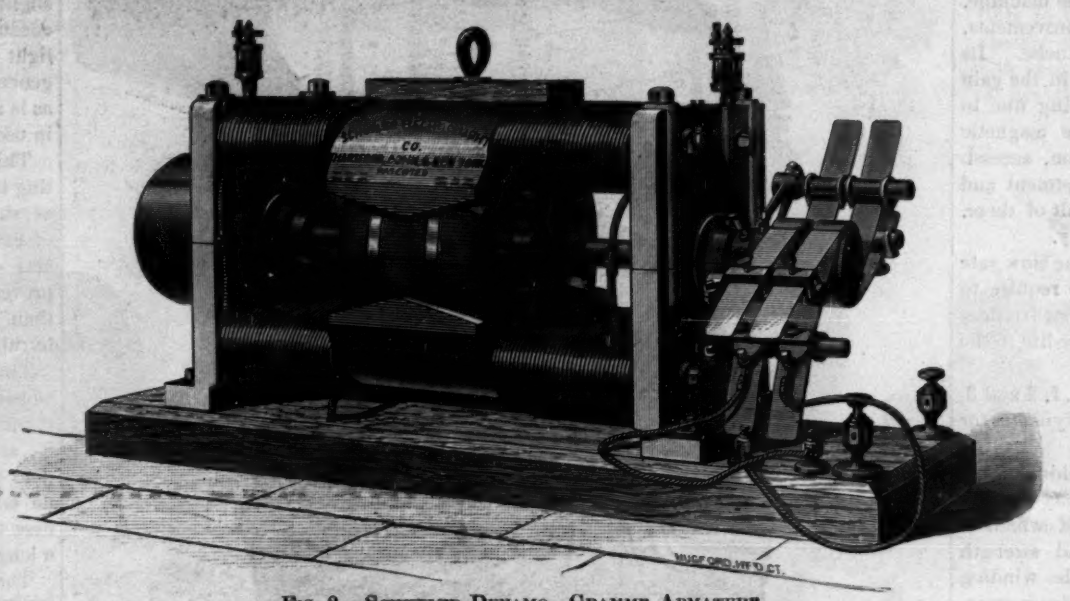

Fig. 2.—Schuyler Dynamo—Gramme Armature.

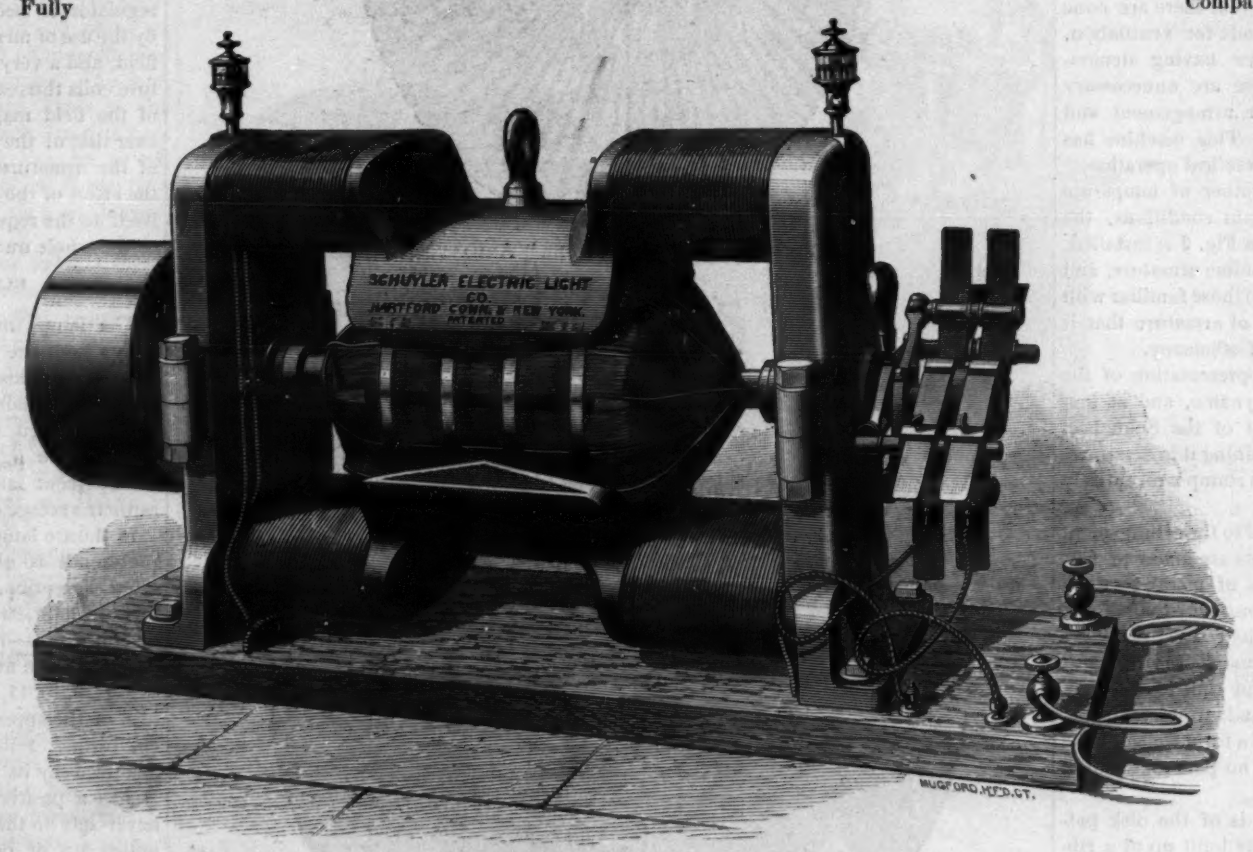

Fig. 1.—Dynamo Machine for Twenty-five Arc Lights.

RE-ORGANIZATION OF THE COMPANY.

At a meeting of the trustees of the Schuyler Electric Light Company, held in New York last week, the Hon. Henry M. Cleveland was chosen its president. This action was deemed necessary owing to the rapid increase of business, which demanded not only increased facilities for manufacturing, but additional help in the executive department. The company is to be congratulated upon having secured Mr. Cleveland's services as president. He has spent about a month investigating the system of the Schuyler Company in comparison with that of other companies, and has become satisfied that the Schuyler Company produces one of the best lights in use, and that the financial prospects of the company are very flattering.

In the reorganization, Mr. Chas. E. Dustin becomes vice-president and treasurer, and will also continue as general manager. Mr. Dustin is known as an honorable, intelligent business man of long experience in Hartford, and deserves the cordial thanks of the stockholders in the company for his success in reconstructing and developing its interests.

The Schuyler Company was organized in 1882 on a capital of $1,000,000. In 1883, inducements were offered for removing the works to Hartford, and a small space was engaged at the works of the Hartford Engineering Company. In the fall of 1883 Mr. Charles E. Dustin took hold of it with other influential gentlemen. After examining the matter very carefully, they became satisfied that there was a nucleus for an enormous business in the manufacture and sale of all kinds of electrical apparatus. The field was very large; not only was the arc lighting rapidly gaining popularity, but the incandescent system was acknowledged to be the coming light.

Mr. Dustin went to work to perfect a reorganization, and during the year confined the sales of the company to isolated plants alone, making no efforts for lighting from central stations until such times as he could get the company on a fair and square business basis. To this end, he had the capital stock reduced from $1,000,000 to $250,000. Of this sum a large portion was paid in cash and a small portion for the patents of the company, in order that as progress was made and new patents issued and new inventions produced they would enhance the value of the company's stock, and not be represented by a large amount of "water." Before accomplishing the reduction of stock, however, Mr. Dustin fully reorganized the electrical staff of the company, bringing from England a competent electrical engineer as chief, with four assistants thoroughly versed in their several departments in the manufacture of arc and incandescent lights.

In the matter of patents to be taken out in this country, and to guard against any possible infringement of their rights, an arrangement was made with Mr. C. L. Buckingham, the electrical lawyer of the Western Union Telegraph Company, of New York, who for ten years was examiner in the electrical department at Washington. All inventions were passed by him before the goods were manufactured and put upon the market. Mr. Buckingham has also invented many appliances of great value, all of which were assigned to the Schuyler Company. As an evidence of the care with which this portion of the business has been attended to, it may be stated that but one suit has ever been brought against the Schuyler Company and that was on a minor feature of a dynamo machine, which was not all-essential for the complete system owned and manufactured by the company.

So rapidly has the business grown that the company have extended their works from a small space of about fifty square feet to a large portion of the Woodruff & Beach Works, and to-day they are so cramped for room that they are seriously considering moving to another city. The Schuyler Company now feels that it has succeeded in perfecting a system which is at once reliable, economical, and efficient and for which they make the following claims:

Economy of first cost; durability; the highest degree of efficiency from a machine of given size; the greatest quantity of light from a horse-power of energy; a great

diffusive power and steadiness of light; great safety and convenience in handling.

In the following descriptions of the dynamos, lamps, and other appliances, there is no attempt to go over again the general features common to all such devices, but special features of value will be indicated.

THE DYNAMOS.

All dynamos are constructed on the same general principles, but there is almost as much difference between the Schuyler machines and those used by the earlier inventors as between the best modern steam engines and those first built and operated. They are built on an intelligent comprehension of the chief elements in the problem to be solved, and with the best modern knowledge as to proportion and form of parts, prevention of wasteful and damaging induced currents, practical convenience and durability. The first dynamo of this company, known as the Schuyler dynamo is of the drum armature pattern. This was first developed by the company and has been proved a machine of high efficiency. Recent improvements have been made in this machine which have greatly increased this efficiency. The other is that known as the Pfannkuche machine, as it contains many valuable improvements, the inventions of Mr. Pfannkuche. Its prominent advantages are found in the gain of power and prevention of heating due to intelligent comprehension of the magnetic lines of force, ease of construction, accessibility of every part, ease of adjustment and handling, compactness as a result of these, very high efficiency and durability.

Another important point is the slow rate of speed at which these dynamos require to be run, for it gives a consequent freedom from strain and rack, and a longer life to the machine.

The accompanying cuts, Figs. 1, 2 and 3, show the Schuyler & Pfannkuche dynamos for arc lighting.

Fig. 1 shows the Schuyler machine of the drum armature pattern for twenty-five arc lights, the most striking feature of which is the appearance of lightness and strength combined which it presents. The winding is after the general method for drum armatures, with the exception that there are none of the usual provisions made for ventilation, the inventor's experience having demonstrated to him that these are unnecessary where there is a proper arrangement and proportioning of parts. This machine has proved very efficient in practical operation.

Where but a small number of lamps are required and under certain conditions, the type of machine shown in Fig. 2 is installed, which is built with a Gramme armature, and it is unnecessary to state to those familiar with the working of this form of armature that it attains a high standard of efficiency.

In Fig. 3 we have a representation of the four-pole Pfannkuche dynamo, and at first glance we are reminded of the Schuckert machine, but, upon examining it in detail, we find many features which stamp it an entirely distinct machine.

Attention may be called to the arrangement by which the field magnets are made to furnish a long, solid mass of metal between their poles, thus giving constancy to the field, while, at the same time, its curvature leaves an open space for the passage of the shaft carrying the armature, and thus makes a design singularly compact and attractive, while, at the same time, it gives a form well adapted for efficiency, and leaves no part that cannot be easily reached.

The armature, Fig. 4, is of the disk pattern, and consists of a core built up of a ribbon of soft iron, wound spirally upon itself to the proper diameter, leaving space at the center for the shaft to pass through, and insulated at each turn by a strip of linen of considerable thickness, which is wound with the ribbon. This core is then wound from center to periphery with a parcelling of linen strips, each turn lapping the previous one until the surface is covered; a coat of shellac is then applied. A band of metal is placed, like the tire on a wheel, upon the circumference of the disk; this band carries metal lugs of dovetail shape, about two inches centers, to which fasten horseshoe-shaped saddle pieces of soft iron about three-eighth inch thick and five-eighth inch wide, tapering slightly toward the ends; the legs, which are about five inches long, fit over the periphery of the core disk, and pass radially toward the center. Between these saddle pieces is wound the wire, the ends of which are carried to the shaft and along it to the commutator, being carefully insulated at every point. It will be seen that the method of winding is very simple, and that all parts of the machine are easily accessible and the ventilation perfect.

The results of these improvements on the common flat ring dynamos are an increased efficiency of about 30 per cent., it is claimed, absence of sparking at commutators, low internal resistance, effective self-regulation and high electrical efficiency. The dynamos driving 100 lights and upwards, it is claimed, show an efficiency of about 95 per cent.

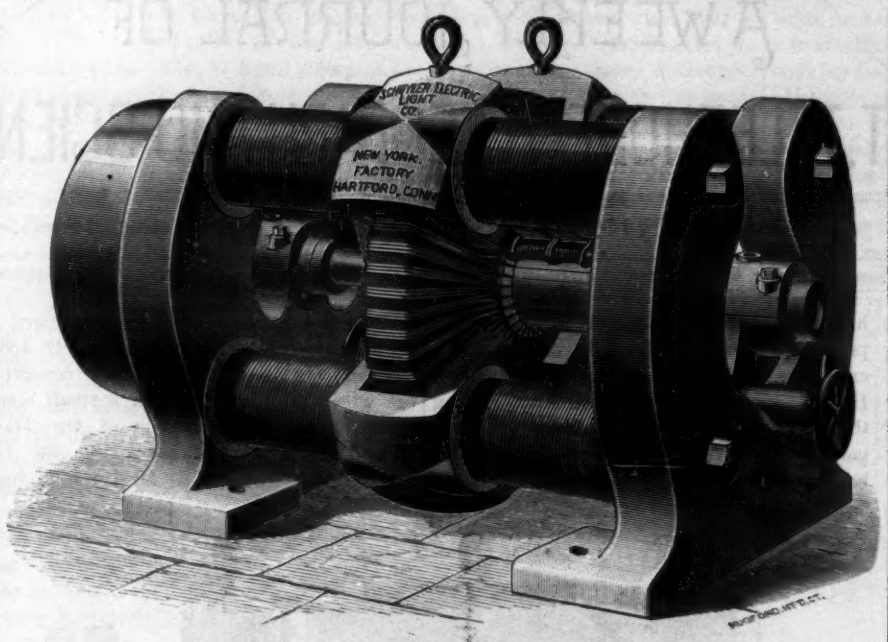

FIG. 3.—THE "PFANNKUCHE" DYNAMO.

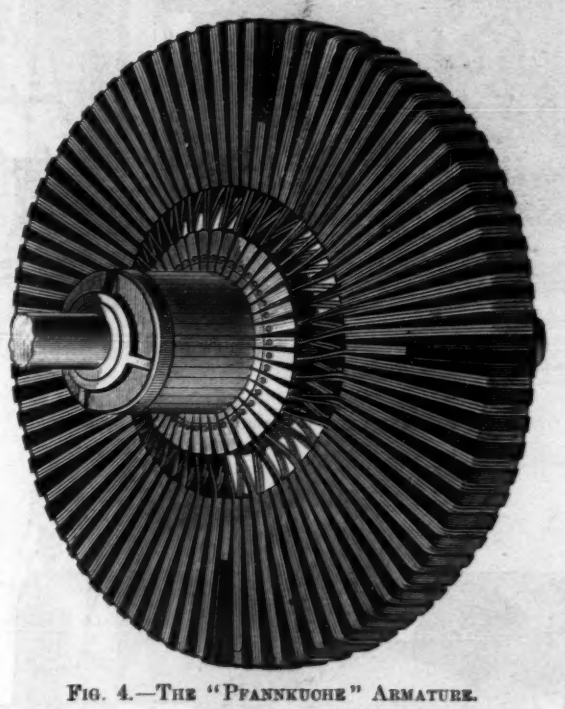

FIG. 4.—THE "PFANNKUCHE" ARMATURE.

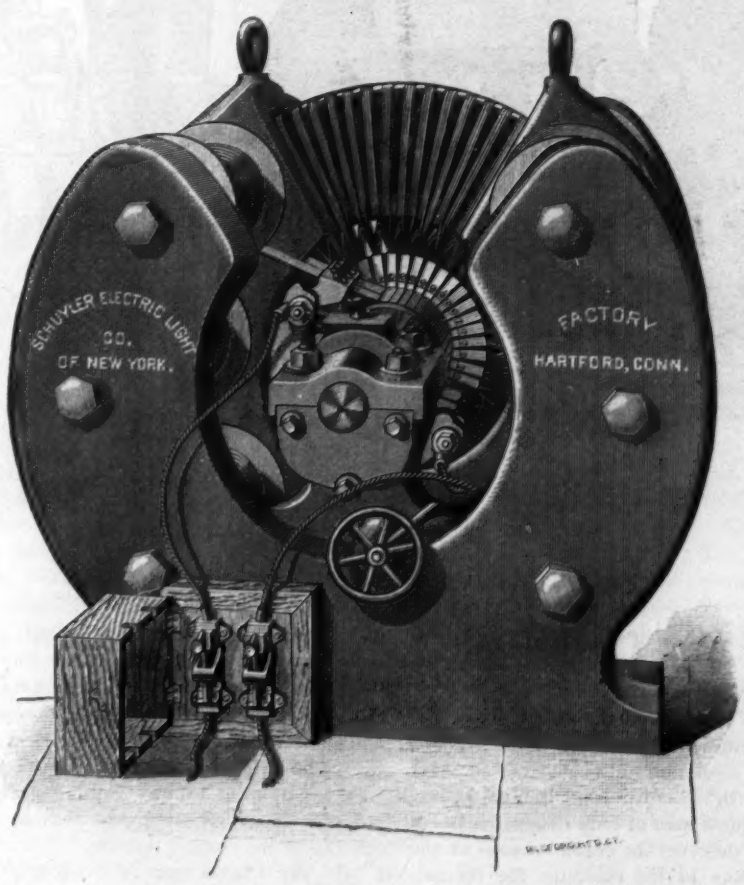

FIG. 5.—END VIEW, PFANNKUCHE DYNAMO.

The dynamos for incandescent lighting are built on the same general plan as the others, but the winding and size of wire is, of course, different.

Fig. 5 gives end view of one of these machines. The current furnished by them is perfectly steady and absolutely harmless. The incandescent dynamos are made to produce any number of lights from fifteen to five hundred. They are perfectly self-regulating, and any number of lights on the circuit can be turned on or out without affecting the rest, a corresponding change taking place in the power consumed by the machine.

AUTOMATIC REGULATION.

The Schuyler system of electric lighting possesses an automatic method of regulation of the dynamos that renders the current perfectly steady, and the regulation of the lamp such that an imperfect carbon of the poorest quality rarely produces the faintest hissing, and the only effect noticed is a slight flame, while the imperfection is being consumed. The regulator used with the arc light dynamo is based on the principle of generating only so much electromotive force as is needed to supply the number of lamps in use at any given time.

This is a very different thing from generating it and only using part of it. The device as shown in Fig. 6 consists of a relay of extreme sensitiveness, and a motor which acts on an arrangement of resistances for preventing the generation of more current than is called for by the lamps actually burning.

The other attachments shown in the figure consist of a device for breaking the whole circuit without danger or sparking, Figs 7 and 8; another for giving a signal if an accident occurs to any part of the circuit, and an automatic cut-out, which acts only in case the alarm signal remains unnoticed for a length of time.

The construction of the dynamo for incandescent lighting is such that no external regulator is needed. This is accomplished by the use of an extremely powerful magnetic field, and a very low resistance in the armature coils thus causing the inductive influence of the field magnets to so far preponderate over that of the currents traversing the coils of the armature as to practically neutralize the effect of the latter. The machine adapts itself to the requirements whether one lamp or the whole number are in circuit.

ELECTRIC LAMPS.

The lamps made by the Schuyler Company, both arc and incandescent, are from new designs and have very decided advantages, it is claimed, in the quality of the light furnished, the ease and safety in handling the arc lights, and the long life of the incandescent lamps, 1,000 hours being given as their average capacity.

In the arc lamp several forms are used, but preference is given to Mr. Pfannkuche's latest invention. It gives a pure, soft and mellow light, without the hard ultra-violet or bluish rays—in appearance it is attractive both in design and workmanship.

Figs. 9, 10, 11, 12, 13 and 14 give a general idea of the appearance of some of the different forms. Substantially the lamp is characterized by its peculiar feeding apparatus. It has a positive motion, and the carbon is never left to the influence of gravity, but is pulled up or down from any position in which it can be placed to that needed for burning to the best advantage.

A detailed description of this form of feed will be given in another issue of the REVIEW. The lamp contains also an ingenious automatic cut-off, by which, in case of accident to any single lamp, it is at once thrown out of circuit, and all the rest on the line burn on unaffected.

In the street light the hood is large and is constructed to reflect in the proper direction, that light which would otherwise be wasted. That for indoor purposes is tasteful in de-

sign, and is provided with an opal globe of peculiar form, which prevents any unpleasant effects from too strong light. The power required for these lamps usually falls far within a horse-power for each lamp.

The double lamp is of the Pfannkuche pattern, provided with two sets of carbons, which last from fifteen to eighteen hours without any attention. These are designed for installation for street lighting, and where lights are needed to be kept burning all night.

The company manufactures focusing lamps and reflectors, for use on steamers, in which the difficult problem of keeping the unequally wasting points of the carbons in the same position, relative to the center of the reflector, is satisfactorily solved.

The incandescent lamps are made under a new process, and are remarkably satisfactory in the light produced, and the average life of the lamps.

These are in the form of pear-shape glass globes, and the carbon is formed from fiber under a peculiar treatment which leaves them with the appearance of a filament of steel, and with something of its elasticity.

They may be pulled or twisted to a considerable extent, and immediately resume the form given them during treatment. When prepared they are mounted on platinum

Fig. 7.

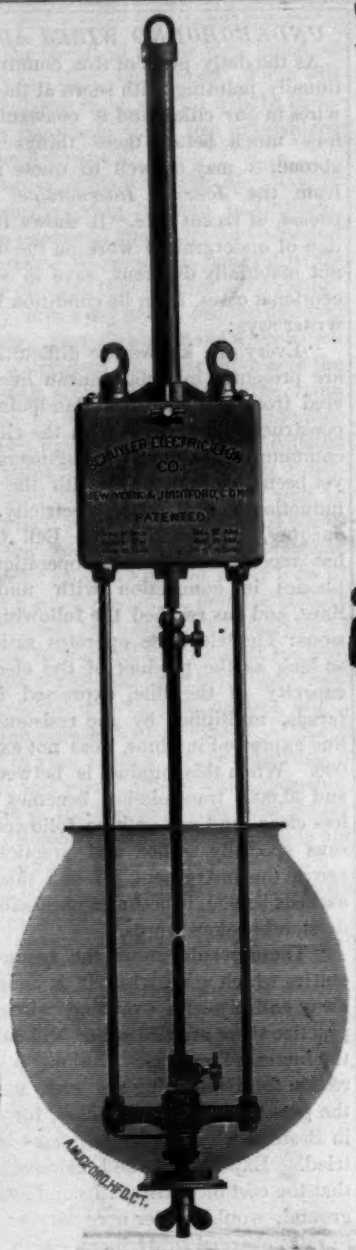

Fig. 9. Outside Lamps.

Fig. 10.

wires, and sealed into the globe. The globe is then exhausted and mounted, and is ready for use. They are tested to burn 1,000 hours or more. Each lamp is of 50 ohms resistance hot, and 117 to 120 ohms cold, and requires a current of one ampere. The company guarantee 10 standard lights to the horse-power of energy. Each lamp is provided with a socket, and can be so arranged as to be turned on or off at will by a switch similar to that used on a gas burner, is indicated in Figs. 15 and 16.

In lines for incandescent lights a safety device is placed in all branches, in fixtures and chandeliers, and in other convenient places, to provide for any possible overloading by the current. This device consists of a small strip of metal, which will fuse at a temperature slightly above that usually carried on the wires, and thereby cut out the entire line and avoid all possibility of danger. These safety fuzes are shown in Figs. 17, 18 and 19.

A simple and effective cut-out of new design is used wherever wires run into buildings, so that lamps may be cut out or turned on from the outside. An indicator shows the amount of current constantly going over the wire, and rings an alarm, should any unusual flow of current go over the line, or should the automatic regulator fail to do its work. The indicator is usually combined with the regulator, and both so arranged as to work alone or together.

Figs. 20 and 21 show the section and perspective of the double switch for throwing one dynamo in and another out of circuit where a group is connected in a series or parallel arc.

In addition to their electric lighting business the Schuyler Company manufacture and supply electric motors and storage batteries.

This company has shown a spirit of enterprise which not only favors its own progress, but that of the electric lighting interests in general. They are fully prepared to demonstrate that lighting from a central station is not necessarily confined to a large city, but that a city of, say, 5,000 inhabitants can likewise have the advantages of arc and incandescent lighting, and at a low cost.

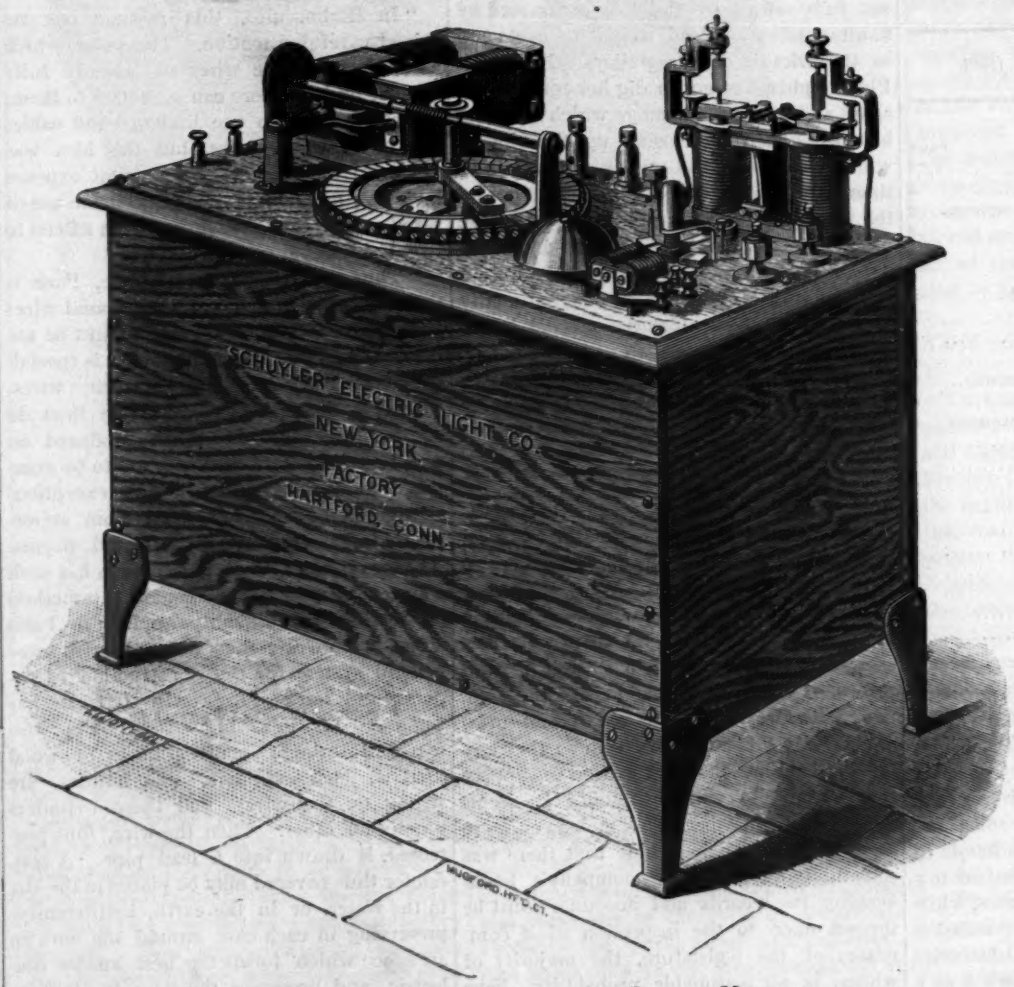

Fig. 6.—Automatic Regulator for Arc Dynamo Machine.

Gas vs. Electric Lights.

Prof. Woodward has been delivering, in St. Louis, an important course of popular lectures no "Sanitation." Concerning ventilation he stated some things which are of general interest. For example, the distinguished lecturer declared that every man vitiated sixty times more air than he breathed. In one minute a gas jet would vitiate thirty three feet of air, and a person ten feet. Gas jets and lamps produced carbonic acid, a steam. London gas gave out sixty-feet of carbonic acid to the hundred; Manchester gas, sixty-three feet to the hundred, and St. Louis gas some sixty feet to the hundred. Electric lights did not vitiate the air. A person who had breathed foul air long would first be affected with drowsiness, then with a partial coma of the will power, and finally with a torpor creeping along the limbs. These symptoms were premonitory of approaching dissolution, and were always experienced in the first stages of death by suffocation.

A man would sit in a foul atmosphere for hours till his energies and will-power were partially paralyzed, and then go out into the keen night air. If he caught cold, as ten chances to one he would, he laid it to the cold horse-cars. Low ceilings were no better nor worse for securing good ventilation in a house than were high ceilings. The air in a flue could be said to draw only by a violent misuse of language, since, in fact, it pushed itself up the chimney.

Slowly perhaps, some think, but *surely* at last all admit the electric light will win as an illuminant.

* * Dr. Wahl, in his usual report to the Franklin Institute, says of the progress of science and the arts, that the Signal Service of the Government is employing the balloon for the purpose of studying the physics of the higher atmosphere. A United States signal officer made an ascension on January 19th, in this city, with Professor King, and another was made last Monday. Dr. Wahl also spoke encouragingly upon the prospect of having cheap gas in the near future,

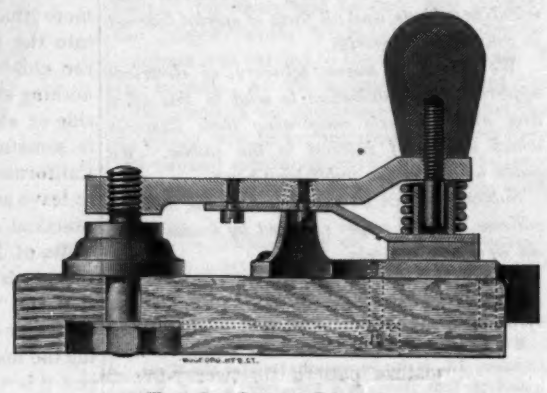

Fig. 8.—Single Switch.

mainly by utilizing the natural gas in the western part of Pennsylvania, and the discovery in New York of a new process for making soda ash as cheaply as the foreign article. A number of samples of lincrusta material for the interior decoration of houses, a new underground conduit, and several instruments used by surgeons for illuminating the throat when operations are necessary, were shown. In the latter the illumination is effected by means of a little Edison incandescent lamp and a mirror, by means of which the surgeon can work with much certainty and dispatch.

.... On Friday last, Receiver Butler, of the Bankers and Merchants' Telegraph Company, issued a circular to the employes of the company, stating that parties stood willing to advance him money sufficient to pay seventy per cent. of all labor debts up to March 1, provided that sum would be accepted as a full settlement of all claims. The night force of the New York office received this circular when the operators reported for duty at half-past five o'clock this afternoon, and immediately notified Mr. Butler that unless satisfactory assurance were given by nine o'clock that the full amount due for February would be paid at once and an early day appointed for the payment of the salaries due for the first half of March they would cease work at that hour. Mr. Butler arrived at the office at about eight o'clock, and endeavored to induce the men to reconsider their ultimatum, but would give no assurance that the full amount due for February would be paid, nor would he say on what day payments on account of March might be expected. The entire force, with the exception of the night manager, chief operator and one operator, thereupon left the office in a body. It is understood that the operators comprising the day force will follow suit.

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We invite correspondence from Electricians, Inventors and the Telegraph and Telephone fraternity and those engaged in Electric Lighting on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

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NEW YORK, MARCH 28, 1885.

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Our contemporary, the *Manufacturers' Gazette*, says that "the tacit belief that a better feeling is beginning to prevail in business circles seems to gain ground every day." A better demand is reported for iron, coal, hides, and the lower grades of woolen and cotton goods. The stocks in the hands of the retail dealers have of late been so low that they had to make some purchases, while the surplus of idle money in the possession of large merchants and manufacturers prompted them to come to the market as a matter of speculation.

The multiplication of lines and the decrease in rates for telegraphic messages has resulted, as was to be expected, in a large increase in the volume of business. Nowhere is this more apparent than in the press. Liberal in the use of the wires as it was two years ago, it is far more so now, and whole columns of matter which, five years ago, would not have been thought of sufficient value or importance to warrant the expense of telegraphing it, are now sent through with a lavishness that smacks of extravagance. In fact the increase in the size of the leading papers of the country, very marked within the past five or six years, is in great measure due to the very liberal way in which the telegraph is now used. Competition has brought prices down, it is true, in some cases to a point so low that it is doubtful whether, considering the expense of delivery, the rate repays cost, but as a matter of fact the volume of business as a whole has been enormously increased, and there is no large business of which some part is not necessarily unremunerative. The Western Union's *alter ego*, the Mutual Union, takes messsages from Boston to New York for ten cents for ten words, as a matter of competition, but there are plenty of lines in the Western Union's system which make up for this and much more.

San Francisco taught us the practical value of cable roads, by putting them into actual operation and making them a commercial success. It begins to look a little as though the city by the Golden Gate was about to do the same thing in the matter of electric street railways. Not that the same thing has not been tried, and with measurable success, in Cleveland, but has it been much more than tried? If San Francisco goes into the thing, it will go in "for keeps," as the children say, and will be satisfied with nothing short of complete success on the one side or absolute failure on the other. There is something in the "wonderful climate of California" which makes people unwilling to leave an enterprise hanging between the practical and the experimental stage, as the coffin of Mahomet was left hanging between the earth and the sky. It is very certain that the iron conduits through which the cables are carried are the ideal things for carrying the necessary electric current conductors, and it is not at all certain that the inevitable loss of current and consequently of power is not fully offset by the loss occasioned by hauling miles of dead weight of cable and in the friction of the pulleys. Now that Philadelphia has got to dig her conduits up again and repair the damage which the frost has occasioned by closing up the slot in which the "grip" rod travels, she will have time to consider whether it would not on the whole be better to use her power for the production of electricity, and to invest in dynamos and motors rather than in untold miles of steel cable which will be continually wearing out and requiring renewal. Philadelphia has a chance to distinguish herself by substituting electricity for cables, without ever having put the latter into actual use. Will she avail herself of the opportunity?

A committee of the Massachusetts Legislature is just now engaged in making a critical examination of the books of the American Bell Telephone Company. What they hope or expect to find there it would be difficult to say. What they *will* find there, we have every reason to believe, is a straightforward record of the daily transactions of the company in the way of receipts and expenditures, *and nothing else*, nor do we believe that any one of them has the least reason to suppose that aught else will be found. It seems absurd that, just because some one chose to throw out a malicious hint that there was something queer in the company's bookkeeping, its records and accounts must be thrown open to the inspection of a committee of the legislature, the majority of whom, in all reasonable probability, have but an elementary knowledge of the art of bookeeping, if any. Had there been any real seriousness in the charge, in fact, had there been any charge at all, with anything more than a mere assertion to found it upon, experts would have been employed, but as it was a mere suggestion the committee contented itself with its own investigations. It will doubtless know more about bookkeeping when it gets through than ever before, and that is about all the examination will result in.

UNDERGROUND WIRES ABROAD.

As the daily press of this country is continually pointing with scorn at the overhead wires in our cities, and is constantly telling how much better these things are done abroad, it may be well to quote an article from the *Journal International del Telephones*, of recent date. It shows the condition of underground work on the other side, not materially different, save in special exceptional cases, from its condition here. The writer says:

"Every one knows the difficulties which are presented by subterranean lines, considered from the electrical standpoint. Their construction interferes with the clearness of communication, and our engineers have not yet been able to do away with the effects of induction and of static electricity. Doctor Jacques, electrician of the Bell Company, has recently studied the operation of telephones in connection with underground lines, and has reached the following conclusions: The telephone operates satisfactorily so long as the product of the electro-static capacity of the line, expressed in microfarads, multiplied by the resistance of the line expressed in ohms, does not exceed 18,000. When this product is between 18,000 and 30,000, transmission becomes less and less clear, and can only be followed by persons specially skilled and practiced in the use of the instrument. When this product exceeds 30,000, it becomes impossible to understand spoken words.

"These results show the technical difficulties which arise when it is sought to do away entirely with overhead wires. But in practice there are still other difficulties, and the increased expense is alone a sufficient reason for abandoning the idea, at least for the present. This is the case, for instance, in Boston, where several systems have been tried. Experiment and calculation show that the cost of putting all conductors under ground, would render necessary an increase in rates charged subscribers, which would be out of all reason.

"In Berlin, also, this question has received careful attention. The poles which carry the telephone wires are already fully loaded, and no more can be added to them. It was proposed to use underground cables enclosed in iron tubes, but this idea was given up on account of the great expense involved, and it was decided to make use of aerial cables, each containing from fifteen to twenty insulated conductors.

"Thus, up to the present time, Paris is the only city, in which underground wires have given satisfaction. But it must be understood that our system of sewers is specially adapted for receiving electric wires. Placed at the top of the arch, the lines do not feel the effects which are produced on underground cables, and they are to be compared to overhead wires, built in exceptionally good locations, protected from atmospheric influences, such as rain and storms. As there is no city but Paris which has such a system of underground canals, this method of solving the difficulty applies to Paris alone, and we are thus driven to risk some general system for the construction of underground lines. M. Fortin Herrman has suggested the following system: The wire is passed through small cylinders of wood (that is, such cylinders, like buttons, are strung on the wire), and these cylinders touch each other. Then the wire, thus protected, is drawn into a lead pipe. A conductor thus covered may be placed in the air, in the water, or in the earth, indifferently, preserving in each case around the wire an air space which forms the best known dialectric, and preserves the wire in all cases in the same conditions as though it were suspended in the air. Mr. Hermann thinks that he has thus solved the problem of having a cable at once in the air and at the same time protected from atmospheric influences and disturbances. It is nevertheless to be feared that this ample arrangement does not annul the effect of static induction. Further experiments, which are to be made forthwith, may give no further light on this point."

It will be seen from this somewhat lengthy but interesting extract, translated from the columns of the journal in question, that in the matter of underground wires, our friends abroad are quite as much in the dark, and, generally speaking, quite as backward as we are in America, despite the repeated assertions of our daily press to the contrary. Of course, in all such statements, the city of Paris is omitted, because its magnificent sewers, which are in reality magnificent subways, which could, on occasions, be used for the transmission of troops and war material from one part of the city to another, offer an opportunity for hanging wires which no other city in the world can or is ever likely to show.

SOME PRACTICAL SUGGESTIONS.

One of the topics proposed for discussion at the recent electric light convention in Chicago was put in the form of a resolution to the effect that the fireman should receive higher pay than the engineer. It was thrown out by the Committee on Topics; and therefore did not come before the convention for discussion; but, while it was an extreme way of stating the case, and therefore gave rise to mirth rather than to serious consideration, the basic fact remains that far too little attention is given to the capabilities of the men who feed the fires under boilers, and to the principles which should govern their work. Firemen are usually "cheap hands"—men who, by a short apprenticeship, have been transformed from common laborers into firemen, and, in a majority of cases, they have never had instruction from any person really competent as to the methods of their work, in order to attain the best results with the least fuel. An electric light plant may be all that fancy ever painted it; the system may be the very best; the engines the most regular in their action and in the use of steam, and the boilers of the very best construction; but, if the fireman does not understand or neglects his work—if he fail to exercise a constant vigilance—the coal bill will surely get the upper hand of the accounts, and show a loss at the season's end.

Considering these facts, which all practical men know from experience, it is a question whether it would not be well for superintendents and others connected with the management of electric lighting companies to make themselves familiar with the principles which govern correct firing, to communicate them to their firemen in such a way as will insure the latter's entire comprehension, and then to hold them responsible for results as indicated by the daily tally of coal consumed. In the case of almost every company it ought to be possible to determine how much coal ought to carry the work through each twenty-four hours with the best attainable firing. This being determined by experiment, any consumption in excess of this ought to demand an explanation, and any continued excess ought to result in a change of firemen. An electric lighting company has got to do its business on a business basis; it cannot afford to be sentimental; it must, if it would succeed, hold every individual to a rigid accountability for his work and its results, and amid them all there is not one who by careless work can do more to invite financial disaster, or by good work can do more towards insuring profits, than the fireman who, shovel in hand, stands all day at the fire-door and pours in coal, which represents a constant output of money. He should be instructed, he should be watched, he should be held accountable, and, like all other employes upon whom responsibility devolves, he should be adequately paid. A cheap fireman is the most costly luxury an electric light company can indulge in. A really good one, who understands his business, and attends to it, is a treasure, and really worth more to the company, service for service, than the man who runs the engines, however efficient he may be. Of course, we would not belittle the importance of the engineer. Properly, he should have the selection and control of the fireman, and *he* should be held accountable for the coal consumption. Theoretically this is often the case, but there are not many instances in which it is actually true that his tenure of position rests solely on results obtained.

Next to the outgo for coal, the most important item of supply expense is carbons. Not long ago the charge for these was so high that it constituted the chief item of expense, but, now that they are down to 2½ cents each, and even lower in some cases, they rank second, except in specific cases where some specially fortunate company, like that in Minneapolis, gets its fuel for nothing, and brings it into the the fire-room by an endless belt. The carbons come carefully packed to prevent breakage, and ought to be served out to the trimmers by exact count. In too many cases this is not done, and the result is that trimmers become careless and wasteful. Such waste is always accounted for on the basis of "crooked carbons," and a little watching will establish the phenomenal fact that some trimmers find, on the average, twice as many imperfect carbons as others. There is a sure and simple remedy for this difficulty. It is to insist that every carbon so defective that it cannot be used in the lamps shall be *brought back*. The decrease in the proportion of crooked carbons that this requirement will occasion is simply startling. We have seen the experiment tried, and have been astounded at its success. We do not hesitate to recommend it to every electric light superintendent in the country.

It is in little economies and guards against waste that savings are made. A proper arrangement of tin pans and screens around a high-speed engine will not only save an immense amount of oil, but prevent the floor from being saturated with it, and thus becoming an element of danger in case of accidental fire. Having a bale of waste where everybody about the premises can help himself at will is not conducive to economy. Allowing the trimmers to help themselves to carbons, without accountability to anybody, will make the supply run out much faster than the most liberal computation would estimate; and, in the matter of fuel, unless it be watched from day to day and from week to week, the coal bill will in time sap the life out of the best lighting company that ever existed.

NOTES FROM CHICAGO AND THE NORTHWEST.

The doings of the late electric light convention are bearing fruit. While the various companies have heretofore felt that to an extent they were compelled by law to take proper precautions in establishing plants—and to do what we are compelled to do is not always consonant with the independence of the typical Yankee—the discussions during the convention so thoroughly sifted out cause and effect in many important particulars, that the majority seemed convinced of the need of proper supervision by some disinterested expert, not only for the general safety of the installations as regards persons and property but the reputation of the company and system itself. A poor piece of work is no recommendation to the electrical engineer, any more than a like quality of manufactured article is creditable to any other designer or maker. A certain amount of hurry-scurry work is always foisted upon the public in the infancy of any enterprise; and the grander the proportions of this, the more likelihood of careless and inefficient work at the outset. But with experience and education the standard of excellence is raised, and in the long run the manufacturer and artisan are benefited.

Close competition has had much to do with a state of affairs which was not at all creditable to very many of the earlier installations in Chicago, and probably other cities have had much the same sort of experience. The controlling supervision of some capable person in the premises will eventually bring about a healthier state of affairs elsewhere, as it has in Chicago, and manufacturers will thereafter have to compete on fair business principles, and do good work at fair profits, while losing less money in costly experiments.

Still, there has been a large amount of useless and unnecessary legislation in this matter. As was once said of a writer, "He puts too much water in his ink," so of laws and edicts relative to this wire business. But it must be remembered that the law-makers as well as the electrical people were green at the work when they commenced. Time will bring the balance right, and all will be benefited when the whole thing has crystallized and become permanent.

In the course of his work the other day, in a wire manufacturing concern in Chicago, the man in charge of the lamps had occasion to adjust one of these, which hangs directly over a pile of some tons of wire. The lamp, by the way, is in a dry cellar, and the dynamo was running. Stepping upon the wire, which lay upon a dry floor, in order to reach the lamp, he had no sooner touched the lamp frame than he received a very considerable shock. The circuit was perfectly insulated at every point, having an insulation resistance of over one megohm. Here was an anomaly which set the electrical heads whirling, and the conclusion was finally reached that the static capacity of the many tons of iron made a condenser of it, and it partially charged through his body. The hint should be sufficient to warn all interested of the possible danger which may arise in similar cases. An iron column, a metal pipe, or floor, might provoke the same sort of discharge. "Keep one hand in your pocket" while adjusting a live lamp, and wear rubbers where possible. Old hands in the business often wear greasy gloves with good results, and the plan is not a bad one by any means.

Electric lighting in Chicago is looking up as the Spring is advancing. The Fuller people are all ready for a start on a large scale on the north side. The United States people are wiring large incandescent plants close by the new Board of Trade, the Home, the Northwestern, and the Royal Insurance Companies' buildings, the Maller building, and the Palmer House barber shop rooms,-a total of about 4,270 lights in all, besides some work without the city limits, and are doing the work in a very complete and satisfactory manner. They are endeavoring to make sample jobs of these, with every prospect of success. The Sperry Company are preparing for arc lights at the Board of Trade, and have re-organized their plant, which was knocked out of time by the Grannis Block fire. The Badger Company is as busy as a bee in a tar bucket. The Edison Company has, after a long struggle with a lot of old-fogy commissioners, concluded a contract for lighting the insane and county buildings at Wauwatosa, near Milwaukee, and are adding to the Pullman Building plant, while doing some other minor work; while the Van Depoele Company—well, they are, or rather the head of the concern is devoting much of his time and energies to the completion of a 50 horse-power motor, which, it is believed, will do most astonishing work. Mr. Van Depoele claims, and with good showing of reason, too, to have made a new departure in dynamos, by which he will be enabled to utilize a larger proportion of power than has heretofore been accomplished.

Speaking of utilizing power reminds one of some misstatements, which might be classed by an agriculturist as "Wood's colts." The assertion was made a year ago or so that six standard lights were run in Chicago by one-half of one horse-power; and, in fact, the indicated power of the engine, taken by a competent party, bore witness to the statement, which was published. But, lacking a photometer test, the table of results seemed rather leaky, to say the least of it. Other parties had fallen into the same trap before, and one who had been through a similar experience, and who stated that "the more lights we put on the easier the dynamo ran," smelled the mouse, and was even afraid the experiment would become known and render him ridiculous in the sight of electricians. Probably the world never will understand that mechanics never give something for nothing, and that a perpetual motion is an impossibility. The one-half horse-power story created some considerable stir, both in this country and in England, at the time, and capitalists went wild over the supposed facts for a few days; but the wonder died out, and the system seems to have gone where the body of Mrs. Hemans' little sailor boy hero went, when

> "There came a burst of thunder sound!
> The boy, oh! where was he?
> Ask of the waves that far around
> With fragments strewed the sea."

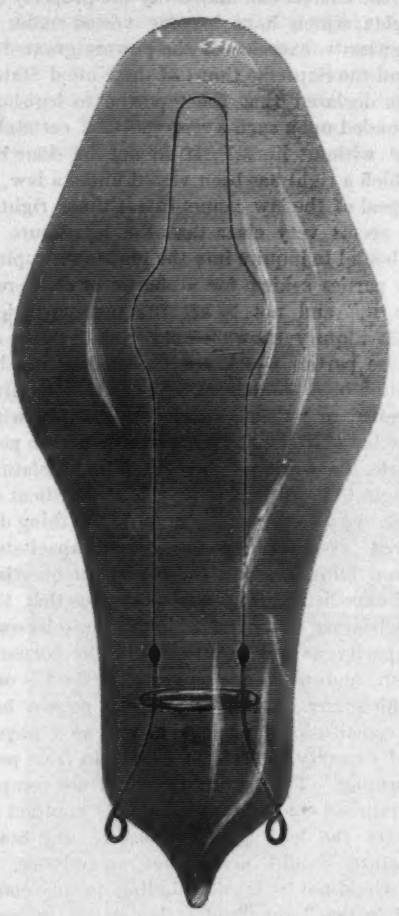


Fig. 16.

Fig. 15.

Incandescent Lamps and Socket.

The Western Electric Co. are pressed to keep up with orders for switchboards. Within the past week the City of Glasgow Exchange has ordered one similar to the Liverpool multiple board, with all the latest improvements. It is proverbial that "you can't shoot a joke into a Scotchman with a gun," but it is equally true that he "kens a gude thing when he puts his een on it," and he has certainly shown his good sense in this instance.

Gen. Anson Stager is confined to his bed at home, with what his friends fear will be his last illness. His trouble is Bright's disease of the kidneys, for which there is no specific. One by one the old, old timers are passing away, and the rank and file of earlier telegraphers, of whom he was one, are already largely numbered with the silent majority. They have signed their last "30," and closed their keys forever.

A novel application of the power of a magnet was lately made in a Scotch mine. Two shafts had been sunk, and it was desired to run a tunnel to unite the two at the bottom. Measurements were made, and directions carefully taken, but when the proper distance had been run the second shaft failed to connect. The engineer in charge decided to try what virtue there was in a magnet. Several bar magnets were framed together, end to end, and lowered the proper depth, while a vertical needle compass was carried to the farther extreme of the tunnel. As the magnet descended the declination of the compass needle located the direction, and in a comparatively short time the tunnel, continued in the indicated direction, was carried through the intervening wall.

An electrician tells an interesting experience of a friend of his, who was possessed of the only Edison pen in a city far removed from the manufacturer. The blessed thing refused to work one day when he had a hurrying job on his hands, and he was obliged to take it apart to put it in order. Nervous at the delay, he dropped one of the tiny screws on the plush carpet. He had been on his hands and knees in a fruitless search for it half an hour or so, and was not in the best of humor when the gentleman happened in to accompany him to lunch. The trouble was explained. A good sized horse-shoe magnet was procured, rubbed over the carpet once or twice, the screw picked up, the pen adjusted, the job worked off on time, and Col. Beetle was only too glad to pay for lunch for himself and friend.

NEW ORLEANS ELECTRIC LIGHT NEWS.

The Common Council of New Orleans has passed a resolution for the Committee on Fire and Lighting to contract with the Louisiana Electric Light and Power Company to light the suburbs of the city, or what is known as the "oil region," which is lighted at the present time with oil lamps. There had been considerable discussion over the matter, but the resolution was finally adopted by a vote of 23 to 7. The system to be used is the Jenney, of Fort Wayne, and the Star Iron Company's towers. The plant will consist of about twenty towers, 125 feet high, with six 2,000 candle-power Jenney lamps on each tower, and a number of other lights on poles or suspended in the streets. The whole number of lights will be 300. $1,200 is the contract price for each tower of six lamps, and $146 for each of the low lights per year.

The Star Iron Tower Company have six towers on the Exposition grounds, and the Jenney Company are running eight arc lights of 2,000 candle-power on each tower. This company is running about 250 lights in the buildings and grounds. The Brush Company has about 300 lights; Thomson-Houston, 140; and the Louisiana, E. L. and P. Co., 300. The last system is composed of Excelsior dynamos and Leavett-Muller lamps. None of the companies has received pay for running lights as yet, and some of them threaten to shut down this week if the money is not forthcoming. According to contract, some should be paid monthly and the others weekly.

Telephonic News

⁂ The bill making telephone and telegraph companies common carriers, was defeated by the Texas Senate on final passage.

⁂ The American Bell Telephone Company has declared its regular quarterly dividend of three per cent., payable April 15, books closing March 29 to April 12.

⁂ Glasgow, Scotland, is putting in the multiple switch-board in their telephone exchange. The equipment is for 800 subscribers, with a capacity for 2,000.

⁂ The Lord Mayor of London now talks with the Prefect of the Seine, Paris, through the telephone, chatting with as little difficulty as if they were in the same room, so says a Paris letter.

⁂ The city of St. Louis furnishes the telephone company 1,429 subscribers. There are a number of small exchanges in the suburban towns connected with St. Louis proper, making the total number about 1,600. Private lines are made much use of in this city.

⁂ Mr. L. M. Fishback, formerly superintendent of the Bell Telephone Company, of Mo., and more recently of the New Mexico Telephone Company, has accepted the position of general agent of the "Sunlight" carbons, Parker, Russell & Company, Manufacturers, St. Louis, Mo.

⁂ The Missouri and Kansas telephone people are substituting hard-drawn copper, No. 14, for galvanized iron, No. 8, in Kansas City, from the exchange to the city limits, thereby reducing the troubles from induction without increasing the resistance of their circuits. The result has been very satisfactory.

⁂ The Chesapeake and Potomac Telephone Company, have ordered five miles of the Patterson cable to be used under ground at Washington. The Central Union Company has ordered a mile of Patterson aerial cable to be used chiefly at Columbus, Ohio. There is quite a demand for the Patterson.

⁂ Mr. Call informs us that the Hudson River Telephone Company put up last week three-quarters of a mile stretch of phosphor bronze wire from Storm King Mountain to Breakneck Mountain, one mile below Cornwall, N. Y. By this route the line works well from Albany to Yonkers, and communication was also had with New York.

⁂ The Electrical Supply Company, Chicago, has received the general agency of the John Roebling's Sons Company's wire. Mr. Terry, the manager of the Supply Company reports trade in general supplies very good. Mr. J. H. Reid, of this company, returned Sunday from New Orleans and St. Louis.

⁂ The Kansas City and St. Louis citizens, who some months ago signed for telephonic service at reduced rates, said service to be furnished by means of telephones other than those controlled by the Bell patents, are asking when they may expect what was promised them. As yet they have no definite replies to their inquiries.

⁂ The New England Telephone Company will commence this week to run copper wire trunk lines out from Boston. A copper wire will be built to Worcester, Springfield and other points in the western part of the State. During the year this work will be very generally prosecuted, not only throughout the State, but in Maine, New Hampshire, Vermont and all other portions of its territory.

⁂ The courts have recently decided that where A, desiring to talk over the telephone with B, asked the operator to call him, and the operator thereupon had a conversation with B, reporting to A, who was standing by, what B said as it came over the wire, the Kentucky Court of Appeals held that in a subsequent action between A and B the former might prove by himself and others what the operator reported to him as coming from B, the operator being called and not remembering the conversation. Sullivan, et al, *vs.* Kuykendall, decided Jan. 22.

⁂ The telephone exchange at Rock Island, Ill., is being fitted up with a new and novel lightning arrester, planned by Mr. Charles Wilson, of the Central Union Company. Any unusual current fuses a fine wire which normally holds a plug in place which, in turn, presses a spring from the ground contact. The wire fusing releases the plug and spring, and the electric charge goes to the ground. The head of the plug where the wire presses against it is insulated. The experiments have found the device of such value that it will be put in the exchange named, and if it succeeds as well as expected, will be adopted more generally by the company.

⁂ The annual meeting of the Mexican Telephone Company occurs April 8, in New York, the books to close March 21. The Mexican Company is practically out of debt, but finds construction expenses eating up the profits. The Mexican Central Telephone Company, one of the best sub-companies in Mexico, finds itself $20,000 in debt, the note bearing 5 per cent. interest, and $6,000 of the amount falling due April 11 next. The holders of the note have agreed to accept stock of the company at $2.30 per share in liquidation of the same. Stockholders have been invited to subscribe $\frac{1}{15}$th of their holdings for this purpose, and already some 40,000 or 45,000 shares have assented, practically insuring the success of the plan and freeing the company of debt. The company has five exchanges in Guanajuato, San Luis Potosi, Zacatecas, Queretaro, and Aguas Calientes. By the last report, nearly a year ago, the company had 316 paying subscribers and 400 sets of instruments. The annual report next month is expected to show an increase. It is understood that a new board of directors will take charge of the property in April, including experienced telephone men.

The Inter-continental Telephone Company is now receiving monthly remittances from Caracas.

The Telephone Contest.

Representative Greenbaige, of Lowell, requested answers to a series of questions at the close of the recent hearings on the petition to compel telephone companies to give the same facilities to the other telegraph companies that they give to the Western Union. Following are the answers prepared by George S. Hale, counsel of the Western Union Company:

The general scope of these inquiries seems to be whether the legislature of Massachusetts may ignore private rights and contracts in a statute affecting corporate business in which the public has an interest, or if that business is transacted by means of rights and instrumentalities granted and protected by the Constitution and laws of the United States, whether the legislature need consider or regard a claim that the proposed statute interferes with these rights, or is bound to frame its legislation so that it will not so interfere. If this is a fair statement, the answer seems to be obvious. But, taking the questions literally in the form proposed:

(1.) "Is the legislature bound to inquire into the position occupied by parties asking for a charter, or chartered by it?" Except as to their capacity to comply with the laws of the Commonwealth and to perform the work proposed, it would seem very clear that it *was* so bound if anything is brought to the attention of the body itself (or of its committee as its "eyes and ears") showing that the "position" referred to gives rights or imposes duties created or protected by a paramount authority. Our statutes carefully provide (Public Statutes, chap. 2, sect. 5.13) for notice of any proposed legislation affecting the rights or interests of individuals or of private corporations, or asking, altering or extending the charter of any corporation (sect. 7), also that particulars as to a new charter shall be given, and that any such alteration be specified—provisions which would be obviously useless if it were not intended that the legislature should inquire into the "position occupied by the parties" and their consequent rights. And the Supreme court of this Commonwealth has expressly declared that "in granting new charters or enlarging, modifying or renewing old ones, and in a large portion of ordinary legislation, it is the duty of the legislature to inquire and ascertain whether existing facts render their action expedient or necessary." The right to amend, alter or repeal an act of incorporation (reserved by Public Statutes, chap. 105, sect. 3) cannot and does not authorize the legislature to disregard the position in which the corporation in question, or any person or corporation holding rights under or acquired from it, stands by virtue of the rights already granted; and while the legislature may make any alteration that will not (1) "defeat or substantially impair the object of the grant or any rights which have vested under it, and (2) that the legislature may deem necessary to secure either that object or other public or private rights;" yet "when under a power in a charter rights have been acquired and become vested, no amendment or alteration of the charter can take away the property or rights which have become vested under a legitimate exercise of the powers granted." And the Supreme Court of the United States has declared that the "power to legislate founded upon such a reservation is certainly not without limit." If an act be done by which a right has been vested under a law, a repeal of the law cannot divest these rights. It seems very clear that the legislature is "bound to inquire into the position occupied by parties asking for a charter or chartered by it," and not to act in a manner which that inquiry shows would violate rights of those parties which are protected against its action by a paramount law. Is that inquiry limited to "their capacity to comply with the laws of the Commonwealth and to perform the work proposed?" The legislature ought to inquire whether it is "expedient or necessary to compel them to do the thing desired, even if they are not incapacitated from doing it. But, passing by the question of expediency, it is equally obvious that the legislature is bound to inquire into its own capacity, as well as into that of the corporation, and whether the thing desired is one which any natural or artificial person has a constitutional or legal as well as a physical capacity to perform or refrain from performing. The legislature could not compel a railroad company to violate its contract to carry the mail on Sunday. If any State statute should make that an offence, it "would not be legally binding on any court of justice," nor could such a statute prevent an express company from performing interstate transportation on that day; and this is because it is an interference with a federal right, power or duty. In such a case it would not be sufficient for the legislature to inquire whether a railroad corporation had the capacity to stop running trains on Sunday. It must inquire whether it might not have the legal capacity to refuse to comply with such a law, or to refuse to omit the work forbidden or might not be (as between it and the United States), without the legal capacity to obey the law. A person or corporation (1) may be capable of performing an act or obeying a law which on the other hand it may have the right to refuse to perform or obey, or (if other parties have contract rights) (2) may not have the legal capacity of taking away from such parties without their consent, an exclusive right which it might otherwise give to all others. In one sense these are questions of "capacity," but not in another.

(2) "Where the corporation undertakes a public duty, does the legislature concern itself with the question of patents as they may enter into the machinery used by the corporation?" Certainly it will not be claimed that, if the corporation has become the owner of a patent which enters into the machinery used by it, the legislature could take away from the corporation the right to that patent, or compel its sale, surrender, or transfer to another corporation for its exclusive or common use at such a price as the legislature thought fit to fix. The legislature may order a railroad corporation to provide safe and suitable brakes, car couplers, etc., and need not concern itself with the question whose patent covers the machinery it selects. It may order one railroad to give equal facilities to connecting roads, but it cannot, under that authority, order it to sell its patent rights or its coal, or to lease its cars to all connecting roads at the same price. Nor if the corporation, as the absolute owner of a patent, has granted to one connecting road the exclusive right to use that patent on its cars in this State or in a section of it only, or for a special or limited purpose, could the legislature take away this exclusive right from the grantee and compel the grantor to grant a like (common) right to a third corporation. The legislature therefore does and must "concern itself with the question of patents" if it undertakes to pass acts which directly or by inevitable implication relate to the patents owned by a corporation and the rights of the owner therein. It must be observed that we speak of the patent or invention, and not of a patented article which has been manufactured, sold, and delivered by the owner or licensee without exclusive provisions. After a patented article has been manufactured and thrown out, as it were, by sale into the common mass of property, it is subject to the ordinary rules relating to that property (see Bloomer *vs.* McQuewan, 14 How, 539, 549). But the very essence of the right or interest in an invention secured by the Constitution, laws, and patents of the United States is the *exclusive* control reserved to the owner (whether the original patentee or grantee), by virtue of which he can give or refuse it to all or to such as he desires to select, with or without reason, cause, or explanation. This right, indeed, does not impair the legislative power to protect the life and health of the community, but the case we are considering relates to something of which it is proposed to compel the allowance on terms dictated by a legislature of a general use as of supposed benefit to the public. "When the corporation undertakes a public duty," the legislature cannot for that reason compel it to perform another public duty or to devote to that duty for public use (without compensation) any private right or property which it could (otherwise) rightfully reserve for itself or for specified grantees by virtue of an exclusive right expressly granted by a paramount authority, but which it has not so devoted to such public duty or use. To what extent, then, has the American Bell Telephone Company devoted its property to a public use? We answer the inquiry in the words of Mr. Justice Story: 'In all these cases the nature and extent of the employment or business, which is authorized by the owners on their own account and at their own risk, and which either expressly or implicitly they hold themselves out as undertaking, furnishes the true limits of their rights, obligations, duties and liabilities. The question, therefore, in all cases of this sort is, what are the true nature and extent of the employment and business in which the owners hold themselves out to the public as engaged? They may undertake to be common carriers of passengers, and of goods and merchandise and of money, or they may limit their employment and business in the carriage of any one or more of these particular matters." Our position is, that under the contract between the telephone and telegraph companies, and between the former and the exchange or sub-companies, it agrees not to license and does not license or devote to the public, the use of its patents in competition for the purpose in controversy.

(3.) "Is not the question to be considered by the legislature simply upon what terms and conditions the charter shall be granted, and how the business shall be conducted, especially with reference to the public?" If we omit the word "simply," the answer is yes; but, in considering what these terms and

The "Schuyler" Electric Lighting System.

Although the same general principles underlie the construction of all dynamos, each machine of each company has its distinctive features, and the relative value of a dynamo to-day consists in the greater or less practical knowledge displayed in the proportion of its several parts.

In the Schuyler system special pains have been taken to keep every part to its most simple form, so that its life shall be a maximum. With this in view, also, the speed of the dynamo has been kept down so that wear and tear shall be a minimum.

In the accompanying illustrations Fig. 1 represents the Schuyler dynamo built for a small number of lights. The armature is of the Gramme pattern, and two pairs of brushes insure safe contact, so as to avoid sparking. Another form of the Schuyler dynamo has a drum or Siemens armature, and is employed for generating current for 25 lights and more. The electrician of the company has designed the dynamo which is represented in Fig. 2. Four pole pieces are employed, and the armature is of the flat-ring type. This leaves very little idle wire in the armature, and the arrangement is such that every part of the machine can be inspected.

The machines designed for incandescent lighting are self-regulating and require no special regulator in the external circuit. With the arc machine, however, the automatic regulator, shown in Fig. 3, is employed. As an arc-light circuit requires a constant current it becomes necessary to provide means by which any change of current is prevented. The apparatus employed consists of a case containing resistance coils, the terminals of which are brought to a circular commutator upon which bears a spring contact mounted on a vertical rod. At the left is placed a small electric motor, which, through two trains of worm-wheels, transmits motion to the commutator switch. At the right there is placed a relay, through which the main current passes. With any increase in the normal current the relay closes a contact which sends a current through the motor and revolves it in a direction such that the resistance coils in circuit will be increased in number. A decrease in current operates the relay so as to revolve the motor in the opposite direction and with the reverse effect.

The table also has an alarm bell which sounds whenever such a change takes place.

The arc lamps employed in this system are of various forms. Two are shown in Figs. 4 and 5.

Special attention has been devoted to the incandescent system, which has been worked out in all its details.

In the recent reorganization of the company, the Hon. H. M. Cleveland was elected President; Mr. Charles E. Dustin Vice-President and General Manager; and Mr. H. M. Linnell, Business Manager.

The first public lighting undertaken on this system was at Holyoke, Mass., where, beginning with 30 arc lights, the capacity has now been increased to 150 lights. Since then, a number of cities have had the Schuyler light installed, among them New Britain, Middletown and Danbury, in Connecticut, and Allentown, Pa.

We may also add that, as reported by us recently, the city of Richmond, Va., has adopted this light for its streets and given the Schuyler Company the sole right to supply private customers for a period of five years.

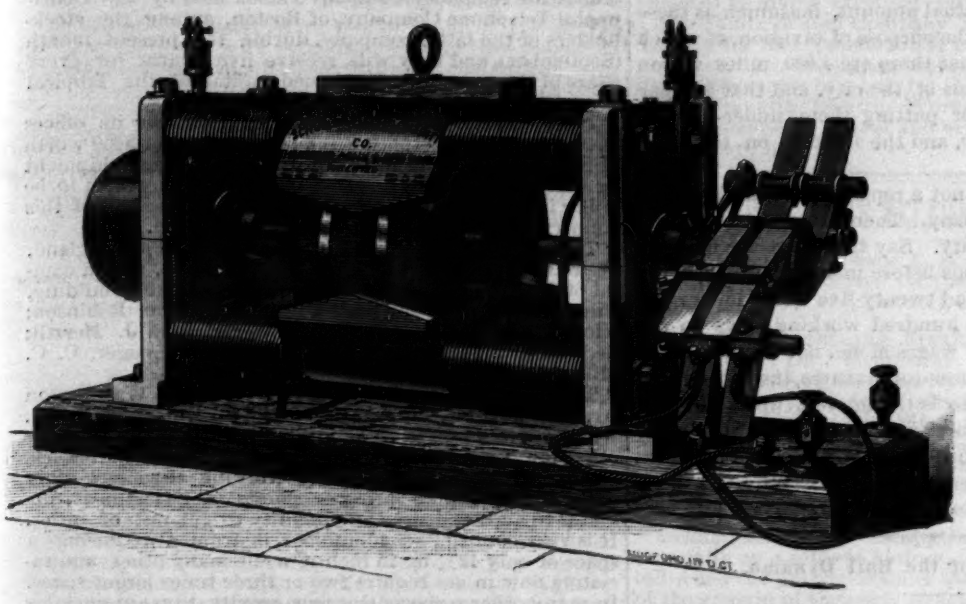


FIG. 1.—SCHUYLER CO.'S DYNAMO, GRAMME PATTERN.

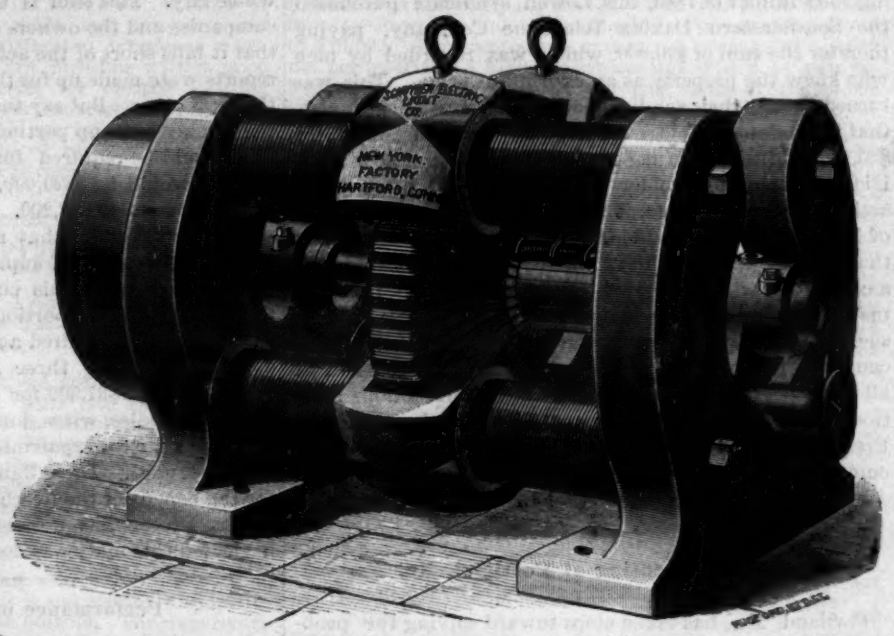


FIG. 2.—SCHUYLER CO.'S DYNAMO, PFANNKUCHE PATTERN.

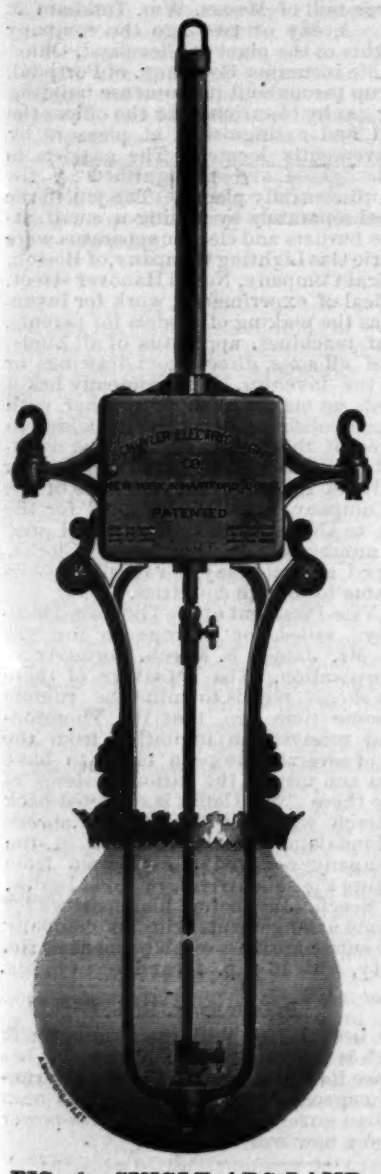


FIG. 4.—SINGLE ARC LAMP.

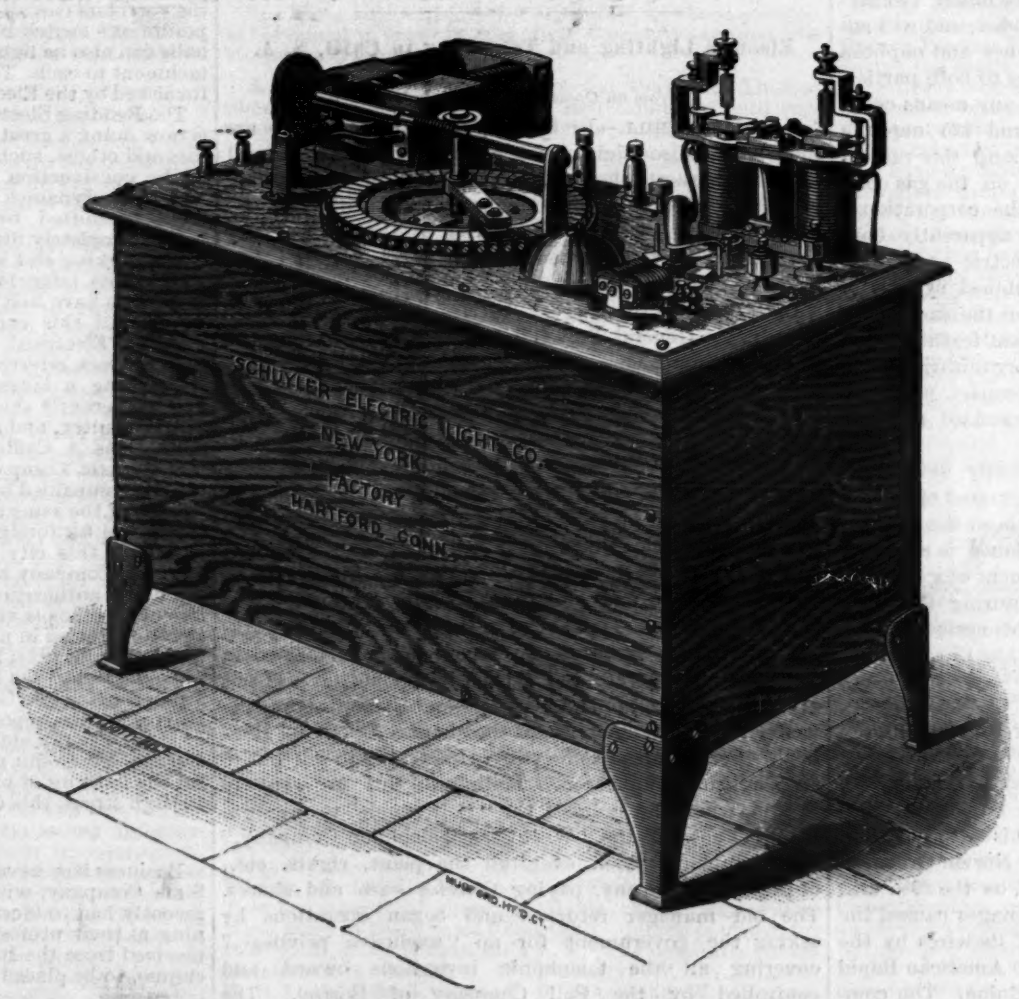


FIG. 3.—AUTOMATIC REGULATOR FOR ARC DYNAMO.

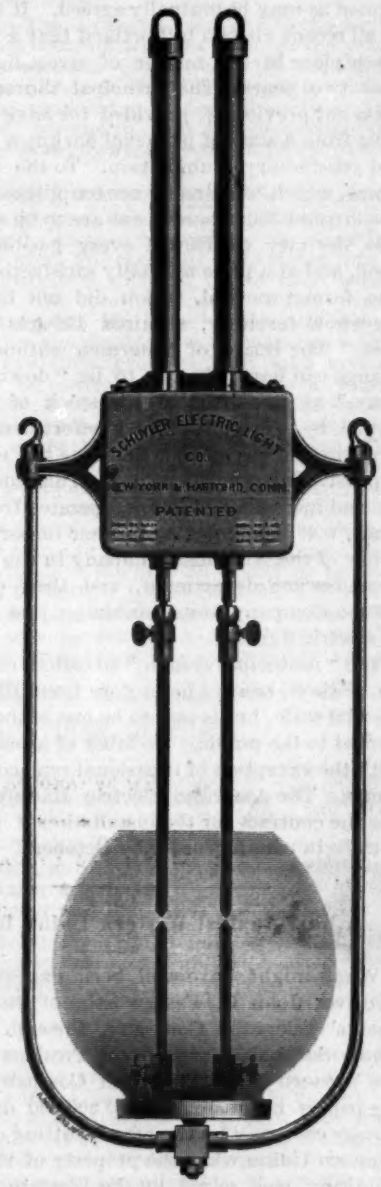


FIG. 5.—DOUBLE ARC LAMP.

Investigating Former Erie Management.

The subjoined notice has been received by Erie stockholders from the secretary of the company, Mr. Charles J. Glidden: You are hereby notified that a special meeting of the stockholders of the Erie Telegraph & Telephone Company is ordered by vote of the board of directors of said company, to be holden at 448 Broadway, Albany, N. Y., on Monday, Sept. 7, 1885, at 9 o'clock in the forenoon, for the purpose of taking such action as the stockholders may deem expedient concerning the matter of the alleged purchase by the then directors or the then executive committee of this company of the Southeastern Dakota Telegraph and Telephone Company and the Arkansas Telegraph Company, and to direct such action in all things relating thereto as may seem proper. With this has

been sent a circular from President Bennett asking stockholders to attend or to send proxies. A dispatch of Aug. 28, from Lowell, says in explanation of the call: The directors of the Erie Telephone Company under the recent reorganization of the board, have discovered, it is said, matters that will be of advantage and profit to the company. A question arose several weeks ago regarding the legality of certain transactions of the old syndicate. During the summer of 1883, the Lowell syndicate purchased the Southeastern Dakota Telephone Company, paying therefor the sum of $70,000, which was regarded by men who knew the property as an exorbitant price. This was turned over to their syndicate at $77,000. It is alleged, also, that the Arkansas Telegraph Company was purchased for $25,000, and turned in at $50,000. The question now to be laid before the stockholders is the legality of these transactions. The syndicate, it will be remembered, consisted of Messrs. Ingham, Glidden, Downs, Bent and Coburn, at that time all officers of the company. It is probable that a committee will be selected by the meeting to take the matter in hand and decide upon the proper course to pursue. It is understood that the directors consulted able counsel before taking this step. They are in possession of all the papers and facts in regard to the transactions mentioned, and Mr. Glidden, when asked about the matter by President Bennett, made a complete statement of the circumstances of the purchase and sale, corroborating the same by the papers in his possession.

Electric Lighting at Portland, Me.

Portland, Me., has taken steps toward solving the problem of effective street lighting in a way which promises to be perfectly satisfactory. Last week papers were signed at the office of the American Electric Manufacturing Company in this city, by which the city of Portland, represented by Edward A. Noyes, Esq., chairman of the street-lighting committee, contracts with the Consolidated Electric Light Company, of Portland, operating the American system through its treasurer and general manager, Frank A. Sawyer, for the use of about 250 Edison "municipal" lamps of such power (from ten to fifty candles), and so located as may be mutually agreed. It has been apparent to all recent visitors to Portland that a great change has taken place in the matter of street-lighting during the past two years. The principal thoroughfare and large areas not previously provided for have been brought almost from a state of primeval darkness to one of brilliant and satisfactory illumination. To the system of 100 arc lamps, which has already accomplished so much, twenty-five arc and 250 incandescent are to be added, and will enable the city to discard every gas-burner and naphtha lamp, and at a price mutually satisfactory to both parties. The former method, which did not by any means cover the whole territory, required 468 gas and 125 naphtha posts. The Board of Aldermen authorizing this radical change can hardly be said to be "down on the gas company," as two-fifths of the stock of the corporation is owned by the city. Every effort has apparently been made by the gas officials to prove the electric system too expensive for permanent use. This combined system of arc and incandescent lamps, operated from the same steam plant, will also illustrate another important feature of the policy of the American company in the organization of an incandescent department, and their compact with the Edison Company, thus combining two standard methods of electric lighting.

The "municipal system," so called, recently devised by Mr. Edison, has not heretofore been illustrated on a commercial scale, but is said to be one of the most flexible now offered to the public. No labor of attendance is required, with the exception of occasional replacement of exhausted lamps. The American Electric Manufacturing Company has the contract for the installation of this system, which is to be in running order by October.

A Suit Against Western Union for $2,000,000.

What might have well been expected has happened. Receiver John G. Farnsworth, of the Bankers & Merchants' Telegraph Company, through his attorney, Mr. Henry Schenck, served upon President Norvin Green, of the Western Union Telegraph Company, on the 29th ult., the papers in a suit for $2,000,000 damages caused the former company by the recent cutting of its wires by the Western Union when the property of the American Rapid Company was seized by the Western Union. The complaint sets forth that on or about the 10th day of July, while the plaintiff was in the peaceful and quiet possession of its property, and engaged in carrying on and conducting its business, the defendant forcibly and with malicious intent, and with a view of destroying its system of telegraphy, broke into and entered upon the said property, cut and detached wires and cables, and took possession of and removed these, together with the instruments. This impaired and in many instances absolutely destroyed the business of the plaintiff, and otherwise inflicted great and irreparable injury to its property. The complaint further recites that the Receiver has been authorized by order of the Supreme Court, in which the action is brought, to begin the suit.

The Cost of Overhead Wires.

Mr. David Brooks, in a letter to one of the Philadelphia papers, makes the following calculation with regard to the cost of overhead wires in Philadelphia:

On September 22, 1884, the total number of miles of overhead wire, as reported to the city authorities was something short of 4,000 miles, and this embraced the whole city. This sum is that reported by the different companies and the owners of private lines. It is presumed that it falls short of the actual amount, inasmuch as these reports were made up for the purpose of taxation, of which they got clear. But say that there are 4,000 miles within the thickly built-up portions of the city, and that $80 per mile would be required for putting them under-ground, the cost would be $320,000, and the interest on this sum at six per cent. is $19,200.

Dr. Jacques states that not a repairman is employed by the Paris Telephone Company. There are at least one hundred employed in this city. Say that there are fifty for the thickly built-up portions before mentioned at $2.50 per day, this is one hundred and twenty-five (125) dollars per day, and counting three hundred working days in the year, there are $37,500 for wages alone, not counting the expense of poles, wires, house-top fixtures, insulators, etc., and this sum for repairmen is the interest upon $625,000 at six per cent. These figures and suggestions are made for the benefit of the overhead wire people, and I ask them if Mr. Preece has not reason to say: "Why you have neglected this matter so long I cannot make out."

Performance of the Ball Dynamo.

To the Editor of The Electrical World:

SIR: I think I stated at the recent Electric Light Convention in New York that the electric light plants on the Croton Aqueduct were obliged to run about 23½ hours daily out of the 24, instead of 15½ hours, as reported in the last issue of THE ELECTRICAL WORLD.

The Ball dynamos there have been averaging 23½ hours' run daily, except Sunday, and in no instance have they overheated their armature or failed to work properly.

Thus far only one attendant has been assigned to each Ball dynamo there, and he sleeps during the night, and while sleeping allows the machine to take care of itself. It is, in fact, a machine of extraordinary merit.

READING, Pa., Sept. 2, 1885. H. W. SPANG.

[The statement attributed to Mr. Spang was so understood by us, and was so recorded on the stenographer's notes.—EDS. E. W.]

Electric Lighting and Telephony in Chili, S. A.

(From an Occasional Correspondent.)

SANTIAGO, CHILI.—In the city of Santiago there are some 2,000 Edison lights being maintained from a central station. Hitherto the commercial value of this system of lighting has not been understood here, but the patrons of the light are so well pleased with it that they lately consented to pay an advance of sixty per cent. rather than have the company stop operations.

In Valparaiso there are 110 Brush lights employed in lighting the General Post Office, hotel dining rooms, billiard halls, and shops. The lights are known as "1,200 candle-power light," are protected by white glass globes, and are remarkedly steady, and give great satisfaction. The Brush people have lately exhibited a tower light consisting of five 4,000 candle-power lights, mounted on a mast 65 feet high, which is located on a hill some 200 feet high in the heart of the city. This light is seen at sea, over 30 miles away, and similar lights are soon to be employed in lighting the towns of the interior. The company is making money and will extend its business rapidly.

The history of the telephone in this country is a remarkable one. Some six years ago a company was formed in Valparaiso to operate the Edison telephone. It did not give good satisfaction, and the Bell and Blake instruments were substituted. Afterward the manager went to England, where he spent some two years trying to sell out to an English organization. Failing in this he went to Boston, where he induced the "Bell people" to organize what is known as the "West Coast Telephone Company." This company "took over" all the plant, rights, etc., of the Chili company, paying therefor cash and shares. The old manager returned and began operations by asking the government for an "exclusive privilege," covering all the telephonic inventions owned and controlled by the Bell Company of Boston. The company succeeded in getting something called a "privilege," but as the government the next week granted a privilege to Webster Gillett for his telephone inventions, and has since then granted others, every telephone must now stand on its merits. As the Gillett is doing splendid work between Santiago and Valparaiso—over 124 miles of No. 8 iron wire of the American Telegraph Company—it will likely come to the front as a trunk line instrument. The Taylor telephone is also on exhibition here, and is said to work well on underground cables. If this be true, its value will soon be appreciated wherever underground wires are employed.

There is, perhaps, no better "field" for the telephone than the West Coast of South America. There are many large cities and towns, none of which have been blessed with this new element of civilization. Let those who can't talk in the United States over the wires, come here with their telephones and win a fortune. PHANTOM.

NEW ENGLAND NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
BOSTON, Sept. 1, 1885.

It is proposed to divide the 17,500 shares of the Tropical American Telephone Company's stock held by the Continental Telephone Company, of Boston, among the stockholders of the latter company, during the present month (September), and they will receive five shares for every share of Continental. The issued capital of the Tropical American is 36,118 shares, par $10.

The Electric Gas Lighting Company, having its offices at No. 45 Milk street, last week sent upward of $600 worth of its electric gas lighting apparatus in a single shipment to South America. The goods of this company seem to be going in all directions, orders from various sections of this country and abroad being constantly received.

The Electric Protector Company, of New England, organized under the laws of New Hampshire, with a capital of $500,000, has taken offices in the Equitable Building, this city. Its officers are: President, Edgar Robinson; Vice-president, J. H. French; Treasurer, John J. Merrill; Secretary, James Swords, and General Manager, C. C. Miller.

The Boston Electric Company, No. 550 Washington street, is now making a new gravity drop annunciator, which is far more simple in its construction than any other gravity drop known to the trade. It requires less battery power to insure perfect working than any other drop, and having no spring or points of adjustment, obviates to a great degree any liability to get out of order. It is very compact—a 40-number instrument requiring a space of only 12¾ by 15 inches, while many other annunciators now in use require two or three times larger space. In many other respects this new gravity drop annunciator is a great improvement on instruments of the kind.

The Ball Electric Manufacturing Co. of New York, offices at 382 Second avenue, has established its New England agency in the Equitable Building, in this city.

The White Electric Light and Power Company has taken large and commodious offices at No. 30 High street. The factory of this company is at No. 10 Mt. Washington avenue, and is one of the best equipped establishments for making electrical apparatus in this city.

The Thomson-Houston Electric Company shipped to-day (Sept. 1st) 90 additional arc lights for the large plant in Brooklyn, N. Y. Recently they installed a new plant of 30 arc lights at Galion, Ohio; and also an isolated plant of 38 arc lights in the large mill of Messrs. Wm. Tinkham & Co., Harrisville, R. I. A day or two ago the company shipped 30 more arc lights to the plant in Cleveland, Ohio.

The Union Mutual Life Insurance Company, of Portland, Me., has just had put up throughout its immense building apparatus for lighting gas by electricity. In the offices the gas jets can be lighted and extinguished at pleasure by pressing a button conveniently located. The gas jets in the corridors can all be lighted and extinguished by the janitor at a switch-board centrally placed. The jets in the halls can also be lighted separately by pulling a small attachment to each. The burners and electric apparatus were furnished by the Electric Gas Lighting Company, of Boston.

The Redding Electrical Company, No. 30 Hanover street, is now doing a great deal of experimental work for inventors and others, such as the making of models for patents, or the construction of machines, apparatus of all kinds, and even dynamos of all sizes, direct from drawings or ideas submitted by the inventor. The company has a most completely fitted up machine shop, together with wood-working and wood-polishing departments, added to which is its large force of thoroughly experienced workmen, who have had the handling of this kind of work for years. All this combines to make the facilities of the Redding Electrical Company especially adapted for the kind of work referred to above. This company is at present making a large number of its Watchman's Clocks, and has recently shipped a good many to various sections of the country, and some to foreign countries.

Mr. Chas. A. Coffin, Vice-President of the Thomson-Houston Electric Company., sailed for Europe on the 22d ult., accompanied by Mr. James F. Meech, formerly an official of the same corporation. The departure of these gentlemen for foreign shores recalls to mind the rumors current in this city some time ago, that the Thomson-Houston Company had received an invitation from the municipal authorities of several European cities to have two of its officials visit and inspect the various systems of electric lighting in use there. Mr. Coffin is expected back in October, but Mr. Meech will probably remain abroad for some time. On Monday morning last, August 31, the Thomson-Houston Company received a cablegram from Havre, France, reporting the safe arrival, in good health, of Messrs. Coffin and Meech. Just before his departure for Europe, Mr. Coffin made arrangements with his company for the lighting of his entire business establishment at No. 10 High street, this city, with 16 c. p. incandescent lights.

PROVIDENCE, R. I., Sept. 3.

Business has never been better with the Armington & Sims Company, which is working night and day. It has recently had to increase its force, and the works are running at their utmost capacity. Another order has been received from the Italian government for a 50 horse-power engine, to be placed on a new war vessel.

NEW HAVEN, CT., Sept. 2.

Mr. George H. Simmons, electrician, No. 1,125 Chapel street, has recently been fitting up several residences with electrical apparatus, and his work is well spoken of.

Mr. H. B. Frost, General Manager of the Southern New England Telephone Company, reports the business of his company as being in a flourishing condition.

WATERBURY, Conn., Aug. 31, 1885.

The Connecticut District Telegraph and Electric Company, of this city, operates the Thomson-Houston system of electric lighting, and has at the present time 85 arc lights, which have given from the start satisfacory results. This company has a district telegraph system in Bridgeport and Meriden, and operates in the two places about 550 boxes. One of the leading specialties of this company is the manufacture of zincs for Leclanché and

gravity batteries, made, it is claimed, from the best and purest spelter.

At the great wire factories of Plume & Atwood, Brown & Brothers, and the Benedict & Burnham Manufacturing Company, business is reported as "looking up," with encouraging prospects for steady improvement. All of the above mentioned manufacturers have been and are making improvements in their factories, and are enlarging their facilities for manufacturing wire for telegraph, telephone and electric lighting purposes, to meet the demand of these growing industries, particularly that of the latter.

WORCESTER, Aug. 30, 1885.

The South Worcester Wire Works is one of the largest and best equipped wire establishments in New England, and its manufactures will bear favorable comparison with those of any other wire factory. In the future this company intends to go into the manufacture of wire more extensively than heretofore and will make a specialty of wire for electrical purposes. Its facilities will enable it to make all the highest grades of copper, brass, steel and iron wires which are most desirable for electrical applications.

The president of the company, Mr. E. E. Rice, and the general manager, Mr. Bullard, were formerly associated with the Palmer Manufacturing Company, and their names are familiar to most of our readers.

WESTERN NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
CHICAGO, Sept. 3, 1885.

I visited the station of the Springfield (Ill.) Electric Light Company, in which corporation Mr. A. L. Ide, the well-known engine manufacturer, is the principal stockholder, a few days ago.

The station is located at the corner of Adams and Seventh streets, Springfield, in a convenient building, which is owned by the company. The company has in place seven twenty-light Fuller dynamos, and the two 80 h.-p. engines were the first ever built by Mr. Ide for electric lighting purposes; but they have run right along from the start with entire satisfaction. Plain tubular boilers, forty-eight inches in diameter and fourteen feet long, are used. Two circuits are maintained, with three machines on one and four on the other.

The company is under the superintendency of Mr. Frank Lott, and is on a dividend-paying basis. With the exception of six lights on the Court House dome, all the lighting done is private lighting, and about 120 lights are run in winter and perhaps 25 per cent. less in summer. It is the only electric lighting company in Springfield, and considering the size of the city, and also the fact that there is no public lighting done, is very well patronized.

Of interest to electric light people visiting Springfield are the Ide Engine Works, which occupy a space of 100 × 150 feet, and employ eighty men. Mr. Ide has just been granted a number of patents on improvements in his engines, and has recently sold five of them to Cook County, Illinois, to run incandescent lights in the county buildings. Their aggregate horse-power is 385. Other electric light companies in various parts of the country have recently introduced this engine, among them the Kansas City Electric Light Company, the Dallas Electric Light and Water Supply Company and the Jacksonville Gas Light and Coke Company.

ST. LOUIS, September 1.

St. Louis has not been hampered, as Chicago has, by severe restrictions on the running of wires for electrical uses, and the result of this enlightened policy on the part of the city is seen in the very satisfactory state of affairs in this respect which exists there.

If you want to string a wire in St Louis for electrical use, you go to the proper city official for permission. If there is no line of poles running along the street or streets you wish to traverse, or sufficiently near to answer your purpose, you can get permission to erect a new pole line. If there is a line of poles sufficiently near the desired route to answer your purpose, you are directed to apply to the company owning the pole line for cross-arm room. This cross-arm room the company owning the pole line is obliged to rent you, at the rate of five cents per annum for each pin occupied. In order to be able to avail yourself of the above-named privileges, it is only necessary to be an incorporated company, and to be able to file an acceptable bond for twenty thousand dollars.

This condition of things has proved very satisfactory to the electric light companies, of course, and has made it possible for them to devote all their energies to the procuring of business and the establishment of plants. The result is that St. Louis shows up extremely well in the matter of electric lights, as will be seen further on.

The St. Louis Thomson-Houston Company is located at Seventeenth and Walnut streets, where it has a station equipped with twelve dynamos, with a capacity of 320 lights I was informed that six more machines for this plant had been ordered, and were then on the way from the factory. These machines are expected to be in place ready for work by the first of October, when the plant will have a capacity of six hundred arc lights. This will make it the largest arc light plant in the West, as far as my information goes. The station is very complete in its equipment, and the company are doing well. They run two large engines in this plant, though they have lately put in a smaller engine made by Mr. George J. Fritz, of St. Louis, with which the Vice-President and Manager of the Electric Lighting Company, Mr. D. R. Powell, is very well pleased indeed. The superintendent of the company is Mr. L. C. Atwood. The business of the company is confined to commercial lighting, as there is no city lighting done in St. Louis. There are probably about 25 Thomson-Houston arc lights in St. Louis in isolated plants.

The Brush people have a very neat station at Seventh and Walnut streets. There are seven dynamos here, with a capacity of 350 lights. One New York Safety and two Watertown engines are used. Mr. O. L. Collins is the superintendent of the company. There are also about 100 Brush lights in isolated plants in the city.

The Heisler Electric Light Company is represented in St. Louis by about 240 arc lights, all in isolated plants.

The Excelsior people are running about an even hundred arc lights, as are also the Weston.

In East St. Louis, just across the river, there is a vigorous Thomson-Houston company, running 100 arc lights.

The incandescent people are not by any means unrepresented in St. Louis, and I may be able to give you some information in this direction at an early day.

The American Carbon Company report business to be good, their orders running close up to their capacity.

The Parker-Russell Carbon Company are now turning out one hundred thousand carbons per week, and expect soon to increase their capacity.

Reference is made above to the fact that the Thomson-Houston people in St. Louis are using one of the Fritz engines with good results. I was shown this particular engine after it had been running twenty-two arc lights some twelve hours, and it was hardly warm. The Fritz engine was illustrated in THE ELECTRICAL WORLD of August 29. It is very simple, durable and compact, and seems to be giving excellent satisfaction wherever used.

The Shultz Belting Company are meeting with a good demand for their patent fulled belts for electric lighting purposes. Mr. Shultz has been very successful in meeting the requirements of a belt for this special use.

The Franklin Electric Works, of St. Louis, are doing a fair business in model and experimental work, and in their other lines.

THE TELEGRAPH.

Ohm's Law.—Professor A. L. Arey favored the Buffalo, N. Y., Electrical Society on the 22d with an interesting lecture on Ohm's law, the volt, etc.

A Curious Lightning Freak.—A correspondent writes as follows: On Wednesday, July 29, the lightning struck one pole of the Bankers & Merchants' Telegraph line (now operated by Western Union) about one mile east of here (Menomonie, Wis.); the bolt divided, ran each way, and went down 9 consecutive poles on each side of the one it struck, so that 19 poles in all were shattered. It was seen by a dozen men at the farm house about 40 rods away.

Submarine Cable Grappling.—In cable operations, especially on a soft sea bottom, it is sometimes difficult to tell when the grapnel reaches the bottom. The experience of the captain of the cable steamer is often relied upon for this, his acquaintance with the strain of the grapnel rope telling him, by the feel of the rope, when the grapnel has landed. Sir James Anderson and Mr. Kennelly have, however, devised an electrical tell-tale for this purpose. It consists in attaching a hollow chamber at or near the grapnel, and communicating by a wire with a cable running up the grapnel rope to the ship, and in circuit with a battery and electric bell or other alarm. A quantity of mercury contained in the hollow chamber serves to complete the circuit and ring the bell when the grapnel and chamber reach the bottom, because when this occurs the mercury flows until it completes the circuit by establishing contact between the wire to the ship and an earth connection.

THE TELEPHONE.

Mexico.—The Pueblo Company has just been reorganized with Mr. Guireaud as manager and Mr. C. B. Cummings, of Boston, as secretary and treasurer.

One More Injunction.—An injunction has been granted at Cleveland in favor of the Bell Company against the Molecular Company.

A New President.—It is expected that Gen. Thomas Sherwin, the able auditor of the Bell Company, will succeed Mr. Vail as president of the New England Company.

Hospitality.—The telephonists at Providence, R. I., will give the delegates to the National Telephone Exchange Association meeting a trip down the Narragansett Bay on Thursday afternoon, Sept 10, to wind up with a banquet.

A Retiring Man.—Mr. Theodore N. Vail will, it is said, resign the presidency of the New England Company. He will, however, retain that of the Metropolitan Company and of the new American Telephone & Telegraph Company, for long-distance business.

The Telephone in Tonquin.—The telephone system in Tonquin, extending from its centre at Hanoi, has already reached a development of about 160 miles. The main lines are three in number. The number of messages circulated upon the three lines amounted during the first eleven months of 1881 to 151,000.

Mr. Charles A. Rolfe, of Utica, N. Y., has accepted a position with the Western Electric Company, and for the present will have his headquarters at the New York office. Mr. Rolfe is well known to telephonists and electricians generally, and enters upon his new work with the good wishes of a very large circle of friends and acquaintances.

N. T. E. A.—The seventh annual meeting of the National Telephone Exchange Association will convene at the Narragansett Hotel, Providence, R. I., on Tuesday, Sept. 8, at 10:30 A. M. Everything points to a very successful meeting. The Committee of Arrangements is: Messrs. Henry Howard, C. H. Barney, Eugene F. Phillips, J. W. Duxbury and A. C. White.

The Providence Clambake.—The invitations have been issued in very tasteful shape for the "clambake" to be given by the American Electrical Works, Providence, Eugene F. Phillips, President, on Friday, the 11th inst. This, the seventh of these admirable annual gatherings, takes place at the Vue de l'Eau Club. Lunch is timed for 11:30 A. M., and the bake for 3 P. M. The committee of arrangements is: Messrs. J. W. Duxbury, W. D. Sargent, H. B. Lytle, John I. Sabin, E. B. Baker and W. H. Sawyer.

Murder of a Telephone Capitalist.—Albert D. Swan, one of the most active and prominent business men of Lawrence, Mass., was shot at his desk there in the office of the Sprague Bobbin Company, of which he was treasurer, by Henry L. Goodwin, on the 27th ult. Both men were interested in the Molecular Telephone Company, and the dispute that led up to the murder arose out of the patenting of a telephone switchboard invented by Goodwin. It is said that the plea of the defense will be insanity.

A Moonlight Excursion.—The New York and New Jersey Telephone Co. gave a complimentary moonlight excursion to the operators in their exchanges on Wednesday evening, August 19th last. The steamer "Grand Republic" left Jewell's Wharf, Brooklyn, at 8 P. M. for a sail down the Bay and up the Hudson, and returned in time to connect with the midnight trains from Jersey City. Employés of the New Jersey Division crossed from Jersey City to Jewell's Wharf on the annex boat. Although the weather was not very propitious, a very pleasant evening was enjoyed by about 300 people. Excellent music was provided. A collation was served in first-class style, and dancing was kept up with unflagging vigor until the hour of breaking-up came.

Erie Figures.—On the 1st of March, 1885, Erie had a floating debt of $136,000, which has now been reduced to $75,000, and the company has $4,900 in the bank, so that, in a few days, the indebtedness will be further diminished to $70,000. The company is earning an average of $40,000 net per quarter, or $160,000 per annum, which is equivalent to 8⅓ per cent. upon the par value of its 48,000 shares, or to 13 per cent. upon the present selling price of 27½. These earnings are above all expenses of supplies, interest, rentals and new construction. About $12,000 per quarter is being expended for repairs, and $7,500 per quarter for new construction. The $40,000 of net earnings per quarter are in excess of all these expenses, and are likely to increase, since the territory which the Erie Telephone Company covers includes some of the most progressive cities in the United States, including Cleveland, Minneapolis, St. Paul, Dallas, etc.

Output of Instruments.—The number of telephones in the hands of licensees Dec. 20, 1884, was 325,574, an increase for the year of 26,994. The increase and decrease by months in the telephone output for the last eight months has been as follows:

	Gain.	Loss.
January	....	298
February	....	594
March	60	....
April	1,691	....
May	2,442	....
June	2,411	....
July	....	314
August	....	544
Totals	6,604	1,750
Net output, eight months		4,854

THE ELECTRIC LIGHT.

Montreal Willing.—The Light Committee of the Montreal City Council propose to consider the question of lighting the streets of that city by electricity.

Railway Shops.—The Mount Vernon shops of the Northern Central Railway, at Baltimore, are to be lighted by electricity, and a Ball engine has been put in to supply the necessary power. The name of the system to be used has not yet been made public.

Evansville, Ind.—The Evansville Gas & Electric Light Company has made a contract with the city, for ten years to light the streets with ten towers, each 150 feet high, having on top four lights of 4,000 c. p. each. Other lights are also to be provided on poles and arches. The city is to pay $23,920 per annum, and proportionately for any new lights outside the contract. Brush lights will be used.

Long Branch, N. J.—A newspaper correspondent writes: There is a movement on foot to induce the Long Branch Electric Light Company to continue in operation during the entire winter. The company have stated that if the citizens would guarantee them 20 lights they would continue to operate. The receipts from 20 lights would pay the running expenses. Mr. Daly has already promised to take two lights and the Hollywood cottages, which now have a number in their grounds, will take several during the winter. Of course, as Hollywood is a winter resort, the illumination of the grounds was to be expected. They have had the electric lights there all summer, and they have made the evenings very brilliant. The advantage of the lights in the winter to those places which are closed is that they do away with the necessity of so many watchmen. One man can cover as much ground as two or three if he has the brilliant white light to illuminate it for him. It seems to me that the commissioners who control the fortunes of the Branch could do an act full of public spirit by putting two or three electric lights along the bluff and keeping them burning during the winter. They could be seen far out at sea on dark and stormy nights, and would serve as beacons to guide incoming vessels.

APPLICATIONS OF POWER.

Blackpool, England.—Over 21,000 people have already ridden on the Holroyd Smith electric tramway at this watering-place.

Electric Crane.—The electric crane in use in one of the foundries of M. Farcot, at St. Ouen, France, is a thorough success. The generator is situated at a distance of 100 meters, the motor being set up at the crane.

Trying the Daft Motor.—The experiments with the Daft motor, "Benjamin Franklin," on the Ninth Avenue Elevated Railroad continue with great success, and it is likely that the work of hauling passenger cars regularly by it will begin very soon.

Extension of an Electric Railway.—The electric railway, which has been in operation since April, 1884, between Moedling and Brühl, in the suburbs of Vienna, is about to be extended to Hinterbrühl; its length will thus be increased from 3 to 4.5 kilometres. The system adopted is that of Messrs. Siemens, by which the current is produced at a fixed point and transmitted to the motors of the cars by metallic conductors along the route. The power is at present generated by five dynamos, each giving thirty ampères, with a difference of potential at the terminals of 500 volts.

MISCELLANEOUS NOTES.

Electric Eels.—A *gymnotus electricus* from Brazil has been on exhibition in the fish tanks at Fulton Market. It is the first ever seen alive in New York.

The Philadelphia Railway.—In pursuance of an agreement made some few weeks ago with the President of the Ridge Avenue Railway Company by the American Electric Company, the latter has placed at work in the construction department of the railway company about twenty workmen, who are engaged in manufacturing the conduits and placing the motive power beneath the floor

of the cars. The workmen will in a few days commence to lay the conduits. The experiment will be first made on the strip of roadway extending from the depot to Laurel Hill, about a mile in all. The managers hope to have the line in full working order by the 1st of October.

To Register Car Fares.—Edward A. Scales, of Lowell, Mass., has devised an electrical apparatus to be used in registering fares taken on the horse-cars. Two brass rods or strips crossing each other in a series of Vs, one a negative and the other a positive conductor of the electrical current, run along the upper part of the side of the car in the same place that the registering straps now hang. To register a fare, the conductor inserts a small pin made for the purpose at an easy point of simultaneous contact with the two strips, which causes a circuit, and by it the hand on the clock or register is moved the distance that indicates one fare. An application of this ingenious mechanism will soon be made on one of the Lowell horse-cars. It is intended to prevent the registering of fares by others than the conductor. Sometimes it is the case that a person will undertake to stop the car by pulling the bell-rope, getting hold of the registering-strap instead, and sometimes the latter is pulled in malicious mischief. In either case the conductor is out one fare every time it is done.

A New Sugar Process.—The sugar process discovered by MM. Aubert and Giraud continues to be discussed in the technical journals as one of possibly great importance to that vast industry. The process originated in these chemists submitting the starchy matter derived from the potato, after its conversion into glucose in the usual manner, to the action of an electric current equal to about seventy-five volts. The electrodes were immersed in the solution, and the current reversed from time to time. The reaction terminated in about two hours, the finish being indicated by the liquid no longer giving the characteristic color with tincture of iodide or a precipitate with alcohol. The liquid was afterward defecated by means of lime, which was subsequently removed by carbonic anhydride, the sirup being then decolorized and left to crystallize. The crystallized product yielded upon analysis 88.38 of saccharose, 1 per cent. of glucose, 3.67 per cent. of ash and 6.95 per cent. of water. The precise chemical nature of this reaction is an interesting question yet to be determined.

Automatic Bichromate Battery.—An automatic bichromate battery has recently been produced by Messrs. Woodhouse & Rawson, the dimensions of which are only 7½ × 1¾ × 8½ inches, and weight 6 pounds. One charge will light a five candle-power lamp for about two hours. The electrodes are attached to an ebonite plate supported in position over the liquid by the upper edge of the containing case, within which is placed a more shallow case, constituting the liquid reservoir. The reservoir itself is free to move up and down without any possibility of disarrangement, and rests upon a small roller connected with a lever at the bottom of the case. By moving this latter the liquid reservoir is raised, and its contents "immerse" the electrodes. A ratchet arrangement prevents disconnection being made until the battery is out of use. By this arrangement, requiring the use of one hand only an accurate regulation of the electrodes can be obtained. Further, it is easy, when using ordinary bichromate solution, to raise or lower the liquid reservoir from time to time while the battery is in use, and so displace the gas which gathers upon the surface of the electrodes in consequence of their polarization.

STOCK QUOTATIONS.

Telegraph, telephone and electric light quotations on the New York Stock Exchange, Boston Exchange and elsewhere are as follows:

Telegraph.—Am. Dist., b 17, a 22; Am. Cable, b 60, a 64; B. & M., b 1, a 1½; Western Union, b 69¼, a 70.

Telephone.—Am. Bell, b 198, a 200; Erie, b 27½, a 28; New England, b 32, a 32½.

The decline in prices is attributed to the various troubles in New England territory.

Electric Light.—No new quotations.

BUSINESS NOTICES.

A Cable-Clip Compliment.—The Providence Telephone Company has in use 10,000 of the Wright Cable Clip, and Mr. A. C. White, Superintendent of the company, says: "We consider them the best in the market. This company will use no other."

Anti-Magnetic Shields for Watches.—These shields, made by Giles, Brother & Co., State and Washington streets, Chicago, are an efficient protection to the works of watches from magnetism, as many testimonials in their possession show. This firm also demagnetize watches that are already affected. The Eastern Agent is W. A. Wales, 16 Maiden Lane, New York.

The New Repeating Breech-loading Shotgun equals in capacity, it is claimed, four double-barreled shot-guns, and shoots eight rounds with one loading. This gun is offered at the low price of $15, with one dozen loaded shells free. A warranty is presented with each gun, guaranteeing that it is as represented in the advertisement appearing in the columns of this paper. The gun is offered by the World Manufacturing Company, who bear the reputation of being thoroughly responsible.

German Corn Remover

Kills corns and bunions, unfailing, rapid, painless; 25c.
HILL'S HAIR AND WHISKER DYE, black and brown; 50c.
PIKE'S TOOTHACHE DROPS will cure in one minute; 25c.
DEAN'S RHEUMATIC PILLS are a prompt, sure cure; 50c.
GALE'S HONEY, the great cough cure; 25c., 50c. and $1.
HLENN'S SULPHUR SOAP heals and beautifies the skin; 25c.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS

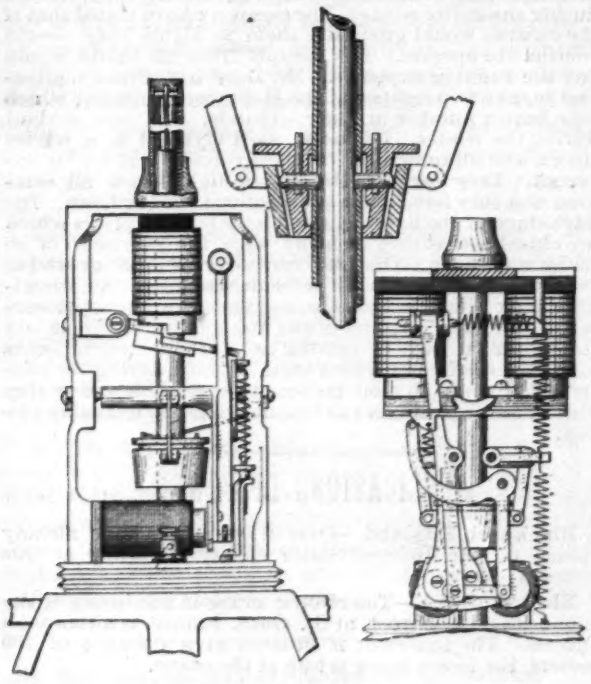
PATENTS DATED AUGUST 25, 1885.

Regulator for Dynamo Electric Motors; Richard H. Mather, Windsor, Conn..... 324,826

As shown in the cut, it consists of a regulating field-magnet located in the main circuit and having one of its poles adjacent to that part of the armature which lies between a like pole of said armature and a like pole of the field-magnet proper of such machine operating as a generator, and between a like pole of said armature and an unlike pole of said field-magnet proper of such machine operating as a motor.

Galvanic Battery; Jesse B. Low, Watertown, N. Y..... 324,858

Consists of a battery composed of an outer glass jar containing an unglazed earthenware porous cup, a carbon porous cup fixed inside of the earthen porous cup, which carbon cup also serves as the positive electrode of the battery, and a negative electrode of zinc or other suitable material.



324,978. ARC LAMP.

Electro-Dynamic Motor; Frank J. Sprague, New York, N. Y., Assignor to the Sprague Electric Railway and Motor Company..... 324,891

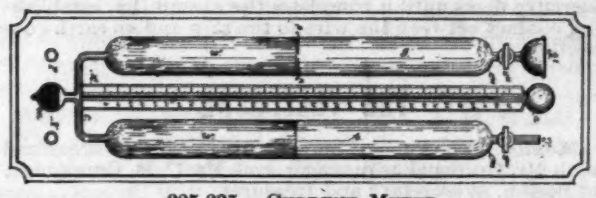
He employs main field-magnet coils in shunt relation to the armature, differential field-magnet coils in series with the armature, and additional accumulative field-magnet coils, also in series with the armature. The main field-coils may be shunted upon the armature alone, or upon the armature and both the cumulative and differential series coils, or upon the armature and either of said series coils, the other series coil remaining outside the terminal of the main field-shunt.

Electric Railway Motor; Frank J. Sprague, New York, N. Y..... 324,892

The field-magnet is sleeved upon the axle of the vehicle at one end, and is supported by flexible connections from the body of the vehicle at the other end.

Socket for Incandescent Lamp; William Stanley, Jr., Pittsburgh, Pa..... 324,894

Includes a base-piece fixed to the bulb of a lamp, and having a pair of contact-points connected with the conducting-wires of the filament, a cylindrical socket adapted to receive and retain the base-piece by a clutch connection, a block of non-conducting material fitted in the socket and carrying a pair of spring-plates with which the contact-plates of the base-piece are adapted to be brought into and out of contact by axial movements of the base-piece, wires connected, respectively, to one of said spring-plates and to an independent contact-plate on the insulating-block of the socket, and a key or switch fitted to turn in said block and by its movement therein to make or break an electric circuit between said independent contact-plate and the spring-plate which is not connected to a conducting-wire.



325,225. CURRENT METER.

Electric Railway; Charles J. Van Depoele, Chicago, Ill..... 324,899

Provides a variable resistance between the motor and the coils of the brake magnet, so that the said resistance can be varied and the field magnets be more or less energized.

Telegraph Insulator; Jacob D. Putnam, South Syderborough, N. H..... 324,957

Consists of an insulator knob provided with an external screw upon its lower part and an annular groove on the upper part, a flange being between the two.

Arc Lamp; Alexander H. Bowman, Packerton, Pa..... 324,978

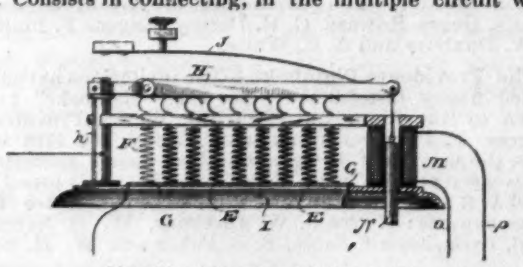
The top view shows a cross-section of the clutch and the other views are of the mechanism in general. The latter is apparent in its construction, while the former consists of two conical collars, the one fitting loosely upon the other, and the inner one fitting loosely upon a tube which incloses the carbon holder, and being provided with plugs which press more or less through holes in the tube surrounding the carbon holder, according to the position of the said outer conical collar.

1. Switch for Incandescent Lamps..... 324,979
2. Safety Device for Incandescent Lamps..... 324,980

3 Process of Making Incandescents; John A. Cabot, New York, N. Y., Assignor to the Cabot Electric Light Manufacturing Co., of Liverpool 324,981

1. Contact pieces are so arranged that rotation of the block supporting the lamp will reverse the current.

2. Consists in connecting, in the multiple circuit with the incandescent lamps, a solenoid with a sliding core, and in adapting the core of the solenoid to operate through a suitable switch, as hereinafter set forth, to switch one or more incandescent lamps into the said multiple circuit to supply the place of any which may burn out or become defective.



325,133. DYNAMO REGULATOR.

3. A strand of twisted fibre, preferably silk, and of the size and texture known in the market as "button-hole twist," is saturated with concentrated collodion, weak glue, or other similar carbonaceous fluid, and then wound upon a former or mold-block and allowed to dry.

Conductor for Electric Railways; John Hopkinson, Westminster, England..... 325,083

Consists in extending the contact-pieces or rollers on the cars transversely to the car, so that the suspended conductor may occupy any position over the car laterally and contact still be maintained.

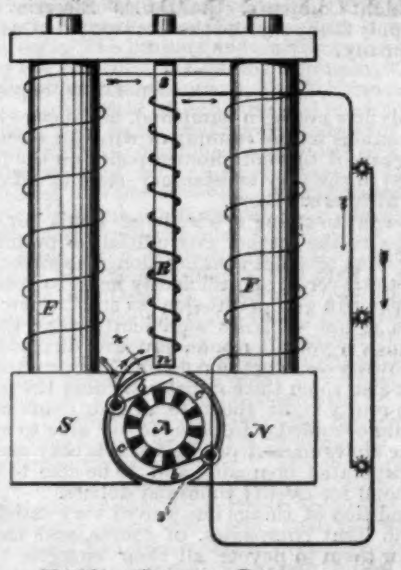
It also consists in placing the contact-pieces on the cars at such a level that they will pass clear beneath the supports of the suspended wire without touching the same or lifting the wire from them.

Electric Belt; Lee Hughes, Marshall, Mo..... 325,086

Brushes are provided at the extremities, and are intended to come in contact and close a circuit from a galvanic couple.

Secondary Battery; John S. Sellon, Hatton Garden, England..... 325,120

Embraces a series of conical or equivalent shaped plates forming compound elements, the component parts of each element having between them insulating material or spaces, the said compound elements being separated from each other, and forming containers of the electrolyte.



324,862. DYNAMO REGULATOR.

Circuit Closer; Adolph T. Smith, New York, N. Y. 325,124

Consists of a hopper, a gate adapted to close the discharge-opening of the hopper and controlled by the armature of the electro-magnet, and a balanced tray, which when depressed closes a circuit from a secondary battery, so that when a ball or other weight is placed in the hopper and the armature of the electro-magnet is actuated so as to allow the gate of the hopper to open, the weight drops down upon the tray, and the circuit from the secondary battery is closed and retained in a closed condition as long as the weight remains upon the tray. Several trays are used, extending in opposite directions.

Regulator for Dynamo-Electric Generators; Charles J. Van Depoele, Chicago, Ill..... 325,133

The regulator proper, as shown in the cut, consists of numerous resistances adapted to be thrown into circuit by a lever operated by an electro-magnet, the terminals of the resistances being spring hooks.

Electric Current Meter; Charles J. Van Depoele, Chicago, Ill..... 325,225

Two electrodes are inserted in the liquid in the tube shown in the cut, and the amount of gas liberated is shown by means of an index hand, which is located at any convenient point above the device, or the height of the liquid, and therefore the electrical energy may be known from the scale.

Copies of any of the Patents mentioned in this Record, can be obtained, with full specifications and drawings, from this office on application; price twenty-five cents each.